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A. PRESCOTT FOLWELL, Editor

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The Editor's Page

Putting Our Houses in Order

What destructive effects the war in Europe and Asia may bring to this country, no one can tell. We all are anxious to prepare, but against what? In this uncertainty there is one thing we can do, certain that it will be worth while whatever may happen or if nothing does—we can put our plants into such condition that, whatever emergency may eventuate we can devote our entire energies to meeting it, unrestrained by any "unfinished business" due to past neglect.

Is there any water works superintendent who does not have in the back of his mind a nagging reminder of something he ought to do "sometime"? Is every area supplied with an adequate number of fire hydrants? Are there enough well placed valves in his mains to limit to a single block the shutting off of supply due to a break anywhere? Are his pump valves all in good condition? Has he adequate duplicate chlorinating equipment?

In brief, can he feel sure that, whatever troubles the future may bring, he will not be handicapped in meeting them by any neglected duties from the past?

The Army Has Modern Sewage Treatment

Records from 45 army camps, forts and stations show that sewage treatment has not been slighted, but that modern sewage treatment plants are the rule rather than the exception. Of the 45 army camps, 3 discharge sewage into the sewer systems of neighboring cities; 1 will have an Imhoff tank; 1 has sand filters; 19 are equipped with high-capacity filters; 5 are activated sludge plants; 7 are primary treatment and standard-rate trickling filter installations; and 9 utilize primary treatment and separate sludge digestion.

The disappearance of the army septic tank (the Doten tank of the first World War) from the larger camps is a matter for congratulations to all concerned —and that means everyone near, or downstream from, such an installation. However, we understand that a few of these still are being installed at some smaller posts, and also some of the "modified Imhoff" tanks. The latter type is deficient in sludge digestion capacity and produces, normally, an odor that is the envy of either a Doten tank or an uncovered garbage dump. Neither of these should ever be built, for they represent a total waste of taxpayers' money and a nuisance in addition.

Getting Ready for Winter

Each year about this season, we wipe the sweat from our brow, start the fan going, place a tall cold drink conveniently handy, and warn each and sundry to get ready for cold weather. It is time to calculate the need for snow plows, chemicals for treating icy pavements, thawing devices for frozen water mains and heaters to keep the chlorinator down at the waterworks operating smoothly. Maybe this doesn't apply in the far south, but even there we recall there were some right cold days last winter—or was it two years ago? Even as far south as Washington, D. C., where the park fountains are reputed, like the Old Faithful Geyser, to spout hot water regularly in July and August, and steam now and then, Old Man Winter is likely to bear down. A little prevention in the line of modern equipment and materials is a good investment. Let's go!

Times Change: It Is Wise to Be Ready

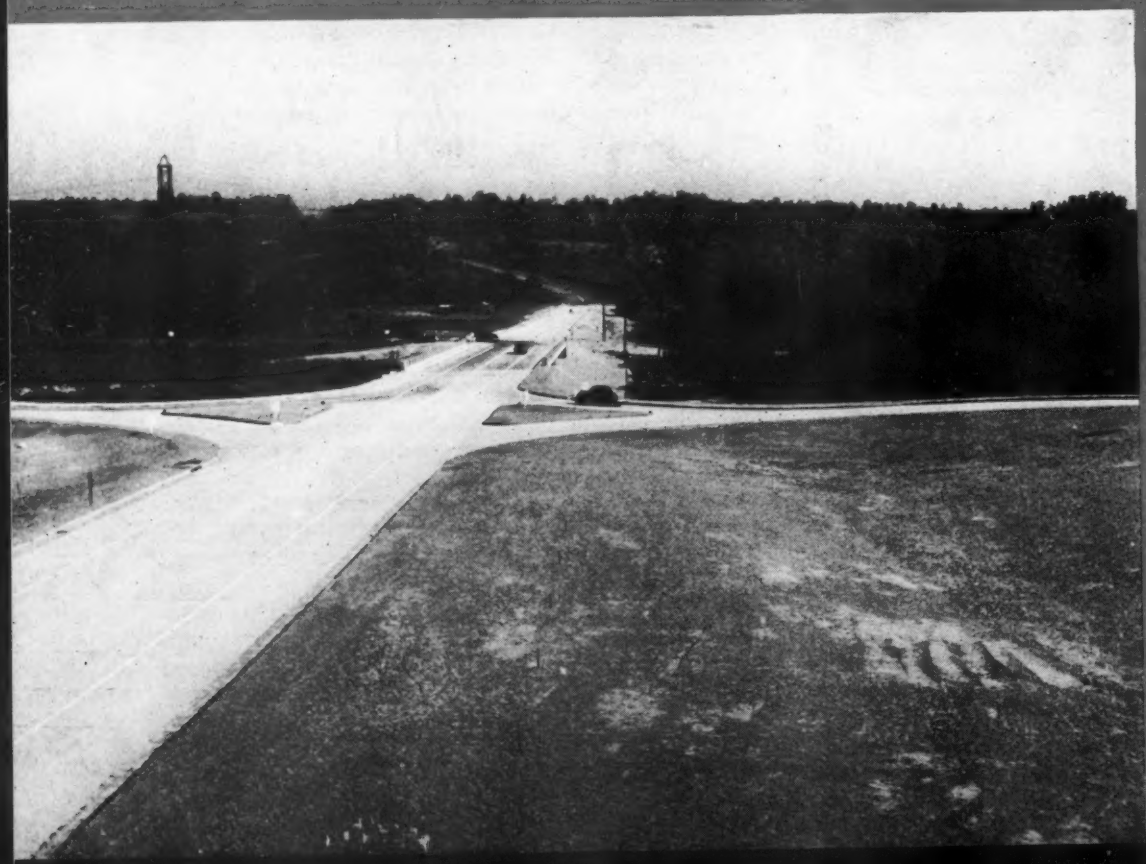
A recent communication from a Pacific Coast city says "for twenty years, the city tried every means possible to provide for the construction of needed sewers. Now in less than two years, these are all being rushed to completion, entailing an expenditure of more than $6,000,000." Such events (blessed or otherwise) occur often in these days. No one knows when an Army camp, an airplane parts factory or any one of a dozen other industries may be dropped into a city, with the result that new housing, new streets, new sewers, new water mains and a dozen other "new" problems suddenly come to a head. Few of our governmental agencies have been ready to meet the emergencies created by the national defense expansions of the past year. State highway departments have permitted delay in essential road construction, even though modern equipment could, in a few weeks at the most, have widened and put durable surfacing on a whole network of secondary roads to relieve the congestion on main roads. Though practically a year has elapsed since army camp sites were selected, health organizations have scarcely begun to function in most of the extra military areas. Advance planning would have helped to expedite action. Further delay will be inexcusable.

High-Capacity Filters for Sewage Treatment

Experience, brief as it is, has pretty well demonstrated that the high-capacity filter is a useful and valuable method of sewage treatment, capable of handling heavy loads and of producing an acceptable effluent. It appears that better results are obtained than with standard rate filters, especially where sewage is strong and where stage filtration is employed. High-capacity filters require, and develop through operation, a different type of bacterial growth than that found in standard-rate filters. This growth requires time to develop. Therefore results obtained by short-period tests at various rates are inaccurate. Probably a month is required to produce any material change in the nature of the oxidizing bacteria. Testing of a high-capacity filter is therefore a long-time job.

One other fact appears to be emerging: That there is no half-way ground. A filter is either high-capacity or it isn't. Overloading a standard filter does not make a high-capacity filter; it is necessary to develop the necessary bacterial growth on the basis of a relatively steady and uniform high loading. This does not mean that new methods will not be developed; but it does mean that an engineer who designs a high-capacity filter in variance with present accepted standards is treading on dangerous ground.

HIGHWAY DRAINAGE



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PUBLIC WORKS Magazine . . SEPTEMBER, 1941

VOL. 72. NO. 9

Racine Water Works Improvements Paid for From Plant Earnings

Recent improvements include additional settling basins, a service building, feeder main, river crossing, pump, and wash water disposal.

WALTER A. PEIRCE
Manager, Racine Water Department

Walter A. Peirce

SINCE the purchase of the water works property by the City of Racine from private owners in 1919, all improvements made to the plant have been according to a planned program of development adopted after a study made by consulting engineers during the first year of city ownership and a further re-study made in 1930. These additions have all been paid for out of plant earnings or obligations against the property, much of which has been retired. This was possible although there have been two rate reductions, the last one of about 30%. At present a population of about 70,000 is supplied with filtered Lake Michigan water.

Our first PWA project was in 1936 and consisted of an 8 m.g.d. addition to the 12 m.g.d. rapid sand filter plant constructed in 1926. Under the last PWA program, further improvements were made at a cost of $483,000 on which a grant of 45% was received. This article deals with the work done under the latter program, which will be described in the following order:

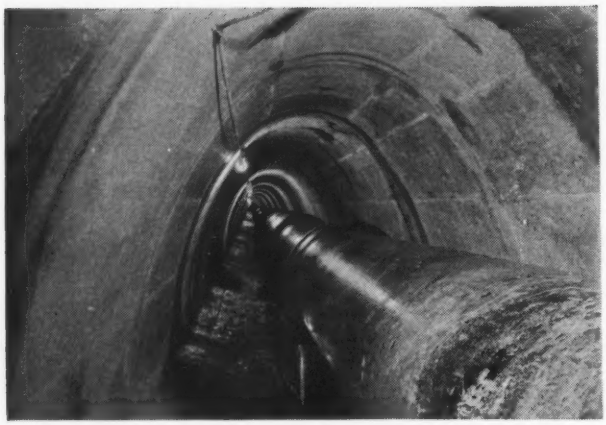
1. Settling basin additions; 2. service building; 3. feeder main; 4. river crossing tunnel; 5. intake connection; 6. standpipe booster pump; 7. improved wash water disposal; 8. cone valves at pumping station.

General view of plant

1. The condition of water entering the filters indicated that an increase in capacity was very desirable and this improvement had been recommended by the State Board of Health. The settling period, following 11 minutes of "around the end" mixing, was 1.9 hours at 20 m.g.d. Designs were made for extending the two one-story settling basins, constructing a third of the two-story type, and installing flocculators. The completed construction gave three basins 40′ x 237′ with 20-foot water depth, and a settling period of 4.69 hours. The results of a year and a half of operation have fully borne out the wisdom of making these improvements, as much better conditioned water is applied to the filters, and wash water has been cut in half.

The basins are of reinforced concrete with flat roofs covered with about one foot of earth maintained as lawn in front of the plant. Upon entering the mixing basin the water is given a quick mix after the addition of ammonia, chlorine, alum or ferrisul (and in certain seasons of the year, activated carbon). The water then passes through the mixing basin and enters the three settling basins operating in parallel. During the first part of the flow through the basins the water passes the flocculators, there being one with five 14-foot diameter paddles in each of the one-story tanks and three with five 8-foot diameter paddles in the lower part of the two story basin.

2. Service facilities for the Department had been scattered and mostly housed in an abandoned pump-



River crossing in tunnel

ing station building two blocks from the pumping station and filtration plant. There was a small shop in the basement of the pumping station, but the major part of the equipment was in the old building, which was not adapted to general shop purposes by reason of the arrangement and varying level of floors and also because it was immediately adjacent to a coal dock, with resulting difficulty in maintenance of cleanliness. The only real advantage of the location was that a railroad siding served the adjacent pipe yard.

The new building is a one-story brick structure 104′ x 155′ with a second floor 20′ x 87′ above one corner. There is a stoker fired boiler in the basement for heating this building and also the pumping station and filtration plant 150 ft. distant.

Quarters are furnished on the first floor for the Construction Department, Meter Department, Machine shop, Carpenter shop, and Garage. The Construction Department space is provided with platforms for storage of repair parts of all kinds, construction equipment, valves and fittings of the smaller sizes. These platforms, which are of 3-inch plank, are at truck bed level and one bay is served by a crane with electric hoist for loading heavy articles. As it was desired to have as nearly as possible fireproof construction, the lumber of these platforms (in fact all wood trim, interior wood doors, etc.) was given fire-proof treatment.

The machine shop is equipped with two lathes, milling machine, power band hack saw, drills, grinders, radial drill, pipe threading machine and many small tools and pieces of miscellaneous equipment. One lathe, the milling machine, radial drill, the arbor press and hack saw were the only ones acquired under the PWA.

The carpenter shop is not intended for large work, but for repairs, small pattern work and the like. It is well equipped with circle saw, band saw, lathe, sander, jointer and scroll saw. Located in the same room is a spray booth for painting meters and similar equipment.

The garage accommodates the portable equipment of the department. Ten trucks and passenger cars are operated, but only wash rack service is given, greasing and repair jobs being sent out. The truck-mounted air compressor and thawing equipment and one large portable engine-driven trench pump are kept in the garage.

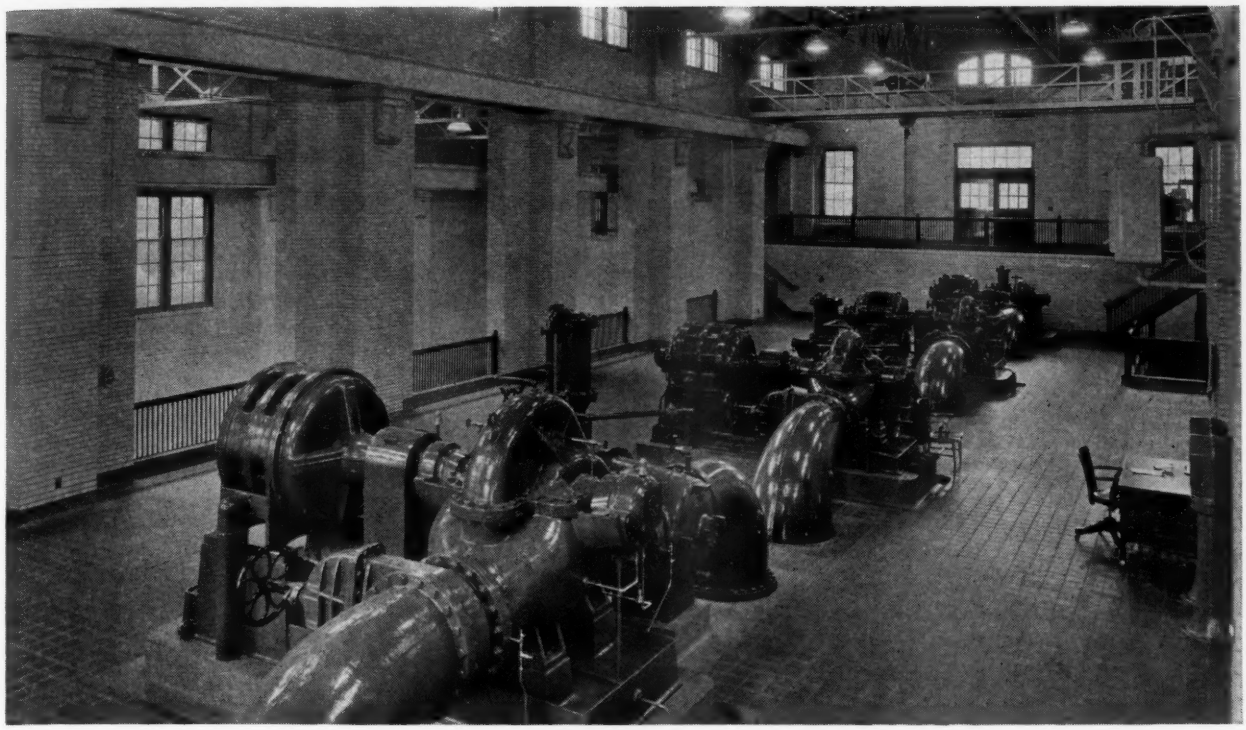
The meter shop is well equipped with benches, racks, grinder and drill, a single testing unit, an eight-gang testing unit and a unit for tests on meters from 3-inch to 6-inch. All machines use calibrated tanks for measurement.

Wire partitioned store rooms well equipped with steel shelving and bins are provided for each department.

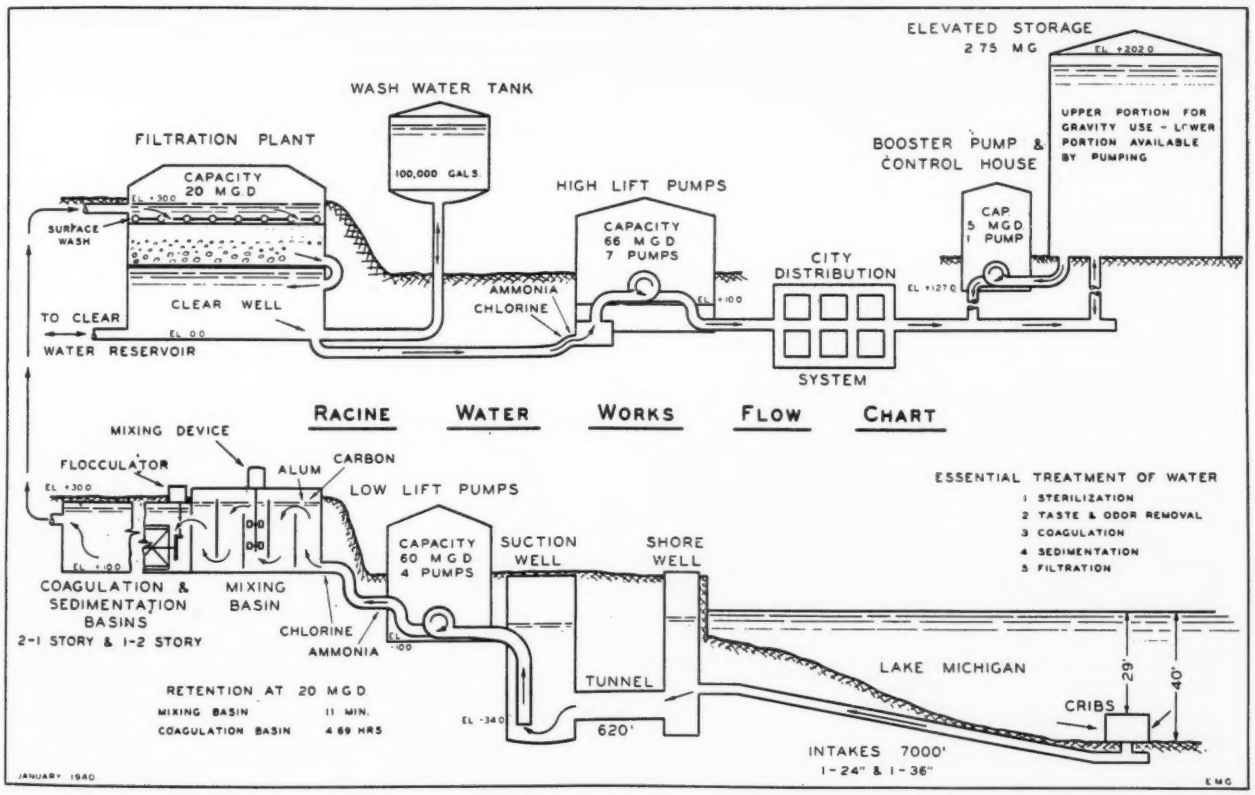
On the second floor are offices for the construction engineer, the assistant manager, a large drafting room and a blue print room equipped with sink, 36-inch blue print machine and a developing machine.

3. The 160-mile distribution system of cast-iron mains from 4-inch to 30-inch was so laid out that full benefit of a 2.75-million-gallon standpipe on the west side of the city was not available to the northwest side. The construction of a mile of 16-inch cast-iron feeder tied these two sections together. As part of its

Filter room of Racine water works



High-lift pump room



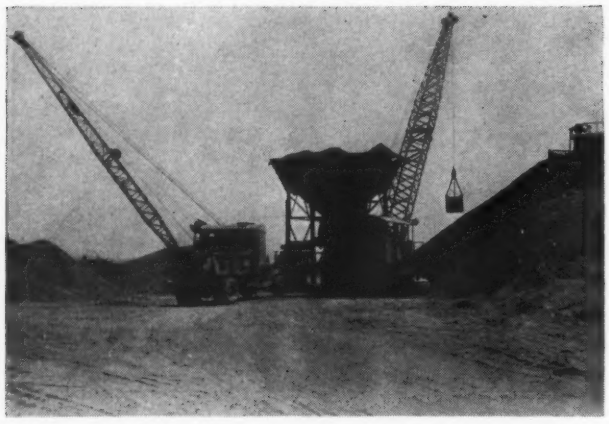
Flow chart, Racine Water Works

length was along streets already served by smaller mains and the balance was on a highway which probably will not be heavily built up for some time, it would have been many years before this main would have been ordered under assessment procedure.

The construction, in clay soil, presented no unusual problems. Class 150 pipe was installed with lead joints and on final test at 100 pounds per square inch developed a leakage of only ten gallons per inch diameter per mile per day, although the specifications permitted one hundred gallons. This fine record was due in large measure to careful inspection (we assigned to the work our construction foreman, Peter Jensen, who has been with us thirty-six years) and to the fact that all joints were observed under normal pressure (60 pounds) before backfilling. The feeder connected with 12-inch mains at the edge of the distribution system and was tied in at two other points of the grid.

4. Root river, a comparatively small stream except at the harbor, meanders through the city on its way to Lake Michigan. In addition to several small pipe, a

(Continued on page 42)



Batching plant for class A concrete. 6-ton 3-compartment bin, 2 P & H draglines with 1½ yd. clamshells

Rapid Airport

By D. F. McCAULEY

Director of the Airports & Airways Section,
Work Projects Administration, Washington, D. C.

THE construction of the Phoenix Military Airport near Litchfield Park, Arizona, an advance flight base of the U. S. Army Air Corps to be known as Luke Field, is an excellent example of a highly mechanized Work Projects Administration undertaking designed to complete an important defense facility within three months' time. The field itself is typical of the fine modern airports of today.

Completion of the great amount of work required by the project within this time limit necessitated the use of an unusual amount of equipment and the carrying out of large daily operation schedules. Meeting these daily schedules demanded that the operations of both men and machines be extremely well organized to maintain an efficient flow of materials and utilization of equipment.

This important military airport is approximately 18 miles northwest of Phoenix. The site embraces 1,440 acres of land of which the actual flying field area is 1,000 acres.

Pug mill concrete mixer, capacity 200 tons per hour lean-mix concrete

Original War Department plans contemplated eight runways, each 6,000 feet long, three of them to be constructed by the WPA. Subsequent specifications shortened the length of each runway to 4,500 feet. Additional WPA work included the clearing of the field, construction of an anchorage apron, a traffic lane and taxi strips, all of concrete; and installation of field drainage and electrical conduits. It was required that the WPA project be entirely completed and available for Army use on July 15, 1941.

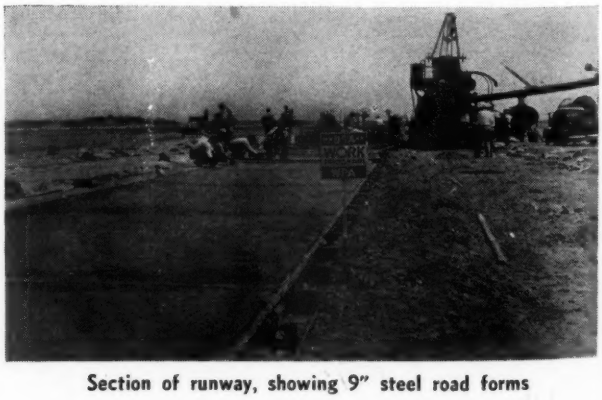
WPA operations began April 7 when work started on the clearing of vegetation, stumps and roots from the 1,000-acre flying field. The first concrete was poured on May 13. By June 20, one of the three runways allotted for WPA construction was completed, and 50 per cent of a second runway and 90 per cent of the anchorage apron had been finished. The traffic lane and taxi strips also were completed by this date.

Each of the runways under this project is 4,500 feet long and 300 feet wide, inclusive of a 75-foot lean mix concrete shoulder on each side. The concrete apron for anchoring and servicing planes is 300 feet by 3,160 feet. The anchorage apron contains 2,200 tie-down anchors and a series of outlets for servicing facilities. The concrete traffic lane is 100 feet by 3,160 feet, while the three taxi strips are each 100 feet by 1,200 feet.

Following the grubbing and grading of the field, the areas to be paved were prepared and graded. Twelve-yard carryalls and motor graders were utilized to advantage in all excavations and earth moving operations. The subgrade was prepared by grading within two inches of the required grade and compacting with sheeps-foot and 10-ton rollers, taking care that the soil had the moisture content necessary to assure proper compaction. Material for the stabilization of the runways was graded from 1½-inch maximum size to that passing a 200-mesh screen, and was spread to provide a thickness of four inches after rolling.

Aggregate for the class "A" concrete was proportioned at a 60-ton batching plant located on the field and delivered to mixers located at the various job sites. Four-compartment, five-ton trucks were used for this hauling operation. Class "A" concrete was mixed in the proportion of 1 cement, 2.6 sand, and 3.7 stone.

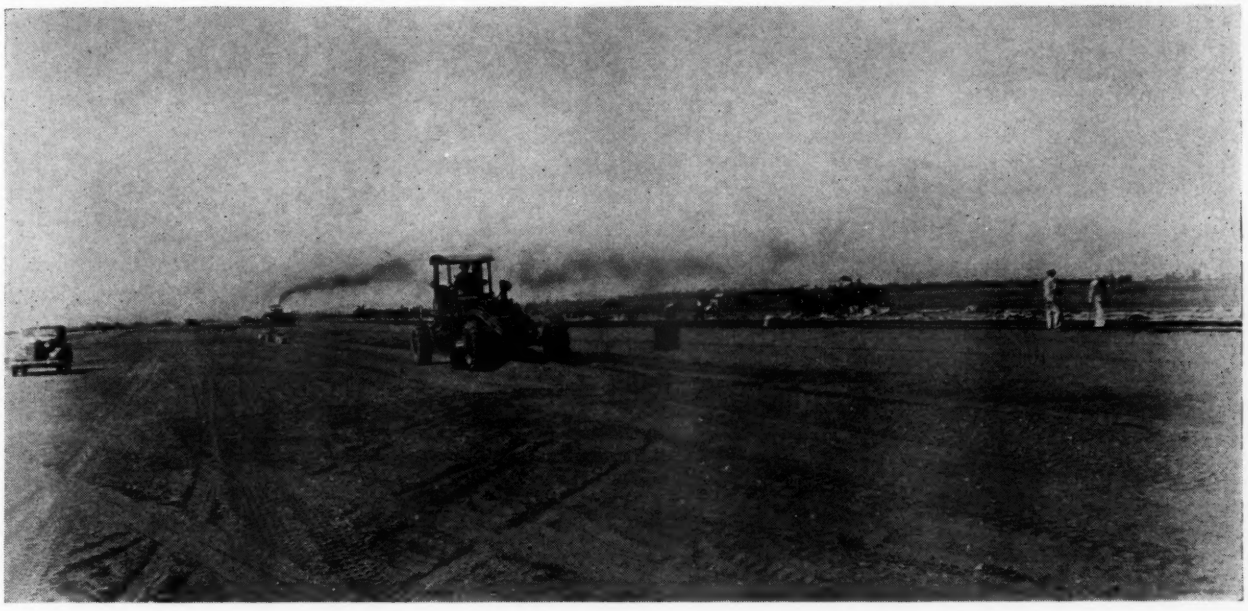
All material for the aggregate base course, for both the class "A" and lean mix concrete, was hauled an average distance of five miles from the points of production to the batching plant at the airport. All aggregate material was purchased from local contractors. The rate of delivery each 24 hours was 6,000 tons of stabilizer, 2,000 tons of stone and 1,200 tons of sand.



Section of runway, showing 9" steel road forms

Construction by WPA

A thousand-acre military flying field in Arizona completed in three months, including clearing land, laying drains and conduits, and constructing three runways, each 4,500 ft. long by 300 ft. wide. A large amount of equipment used.



Austin Western motor grader blading on runway grade; carryall in background

In addition there was a daily delivery of 2,000 tons of aggregate for the lean mix concrete for the 75-foot shoulders which ran the length of the 150-foot wide runways.

Mixed at the job sites in 27-ft. pavers, the class "A" concrete was poured in 12½-foot sections, 6 inches thick at the center and 8 inches at the edges. Each pour was tamped and brought to proper grade by a finishing machine, after which the surface was finished with hand-floats and cured for 72 hours under Sisal-Kraft blankets.

The lean mix concrete was prepared in a pug mill with a 200-ton per hour capacity and was transported to the job sites by trucks. Lean mix concrete pavement for the shoulders of the runways totaled 200,000 square yards. A surface treatment was applied by spraying with asphaltic emulsion at the rate of 0.3 gallon per square yard, covering with sand and rolling.

International tractor and 12-yard carryall

A total of 70,000 cubic yards of class "A" concrete was required for the work accomplished under the WPA project. This was distributed in terms of square yards as follows: The first runway, including intersections, 86,552; the second runway, 65,805; the third runway, 83,267; anchorage apron, 105,333; traffic lane, 35,110; taxi strips, 15,380; and stubs and intersections projecting into three other runway sites, 23,183.

Other materials required by the project were as follows: 107,000 linear feet of 3½-inch and 4-inch electrical conduit; 3,700 linear feet of corrugated metal pipe, ranging from 15-inch to 30-inch diameter; and 5,925 linear feet of concrete pipe of 27-inch and 48-inch diameters. Some 12,000 feet of open drainage ditch were also constructed.

An idea of daily work schedules which were maintained by this project may be obtained from the amount of materials required. Materials used each 24 hours included 13,000 sacks of cement, 450 cubic yards of sand, 900 cubic yards of gravel, 1,500 cubic yards of mixed aggregate, 67,500 gallons of water, 1,600 gallons of gasoline, 800 gallons of diesel fuel oil, and from 1,500 to 2,000 cubic yards of class "A" and lean-mix concrete.

The short time allowed for completion of the proj-

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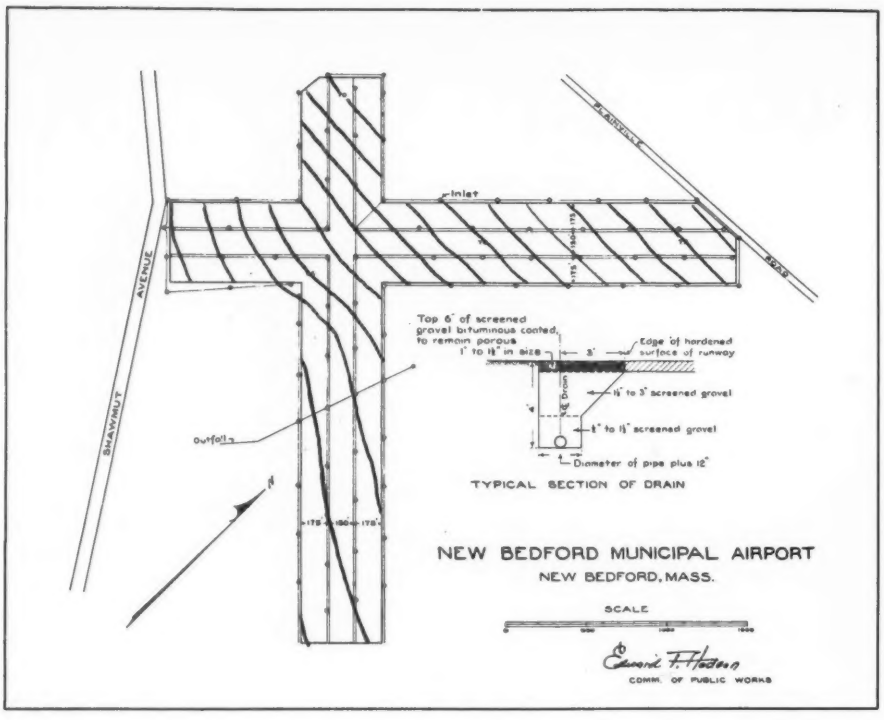


Edward T. Hodson

Modern Airport for New Bedford Within the City

By EDWARD T. HODSON,
Commissioner of Public Works

CONSIDERATION of a proposal for development of a modern airport within the limits of the city of New Bedford, Mass., began in April, 1939. One of the motivating forces back of the plan was the New Bedford Aero Club, whose members are comprised mainly of local flying enthusiasts. This plan was finally placed before the Mayor and the City Council for consideration late in 1939. Comparatively speedy action resulted in an order to obtain title to an area in the northwestern section of the city.

This section is ideally located on improved highways which give easy access to main road arteries leading to important defense corps areas, namely: Camp Edwards at Falmouth, Mass.; Newport Naval Base, Rhode Island; and the First Corps Army Base in Boston, Mass. The land is very flat and the site has an area of 231 acres.

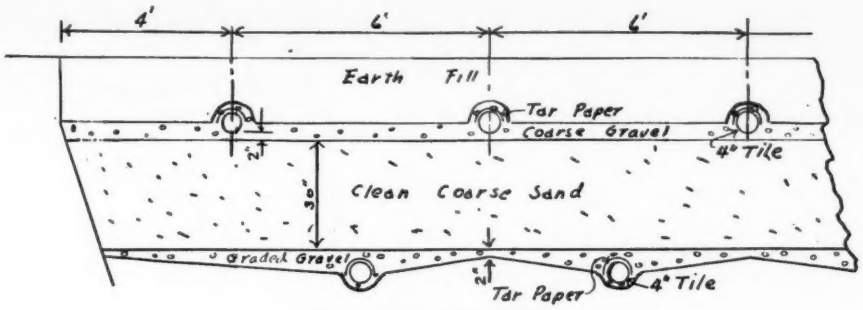
The completed design plan submitted to WPA authorities in Boston called for two runways 3,500 feet long and 500 feet wide. One hundred and fifty feet of the established runway width calls for hard surfacing; the balance of the runway width is to be graded and seeded.

The drainage problem involved considerable study, due primarily to the close proximity of the water table to the finished hard surface. This particular problem was finally solved and the installation of drainage pipes started. The actual design as adopted by me involves the placement of lines of drains of various sizes parallel to the existing hard-surface runway, and approximately five feet from its edge. Catch basins of an approved type were placed at various intervals to trap all surface waters. Due to the character of the terrain, it was necessary to cross the paved runways with a series of drainage lines. Steel pipe coated with asphalt was specified for use on these cross-overs.

The drainage design will also assure a stable soil condition, which is quite necessary to provide the required bearing capacity. This phase of the operations is about 75% completed to date. The grading and compacting of the northeast and southwest runways was completed some time ago.

The alternate runway grading is about 50% complete. The arrival of good weather will enable the construction force to proceed with the installation of these hard-surface runways. This item of construction involves the placement of approximately 27,000 tons of crushed quarried stone, compacted to 4-inch thickness. I have proposed that stone dust be used for filling the voids, then superimposing on this base course two inches of bituminous concrete surfacing, stipulated as type I, Massachusetts specifications. This surface will be placed in two courses, 1¼-inch base course and ¾-inch wearing surface course, and the total tonnage will be approximately 13,900.

An administration building was proposed, but no action in this regard has yet been taken.



Cross-section of sand filter

Planning a Septic Tank Installation for Airport Sewage Disposal

By R. B. KING
Engineer, San-Equip, Inc.

AIRPORTS are generally so far removed from sewer lines that a separate disposal system is required. In planning these systems, a careful survey and analysis of the number of persons using the system during a period of twenty-four hours must be made. This analysis should take into consideration the normal increase over a period of ten to fifteen years.

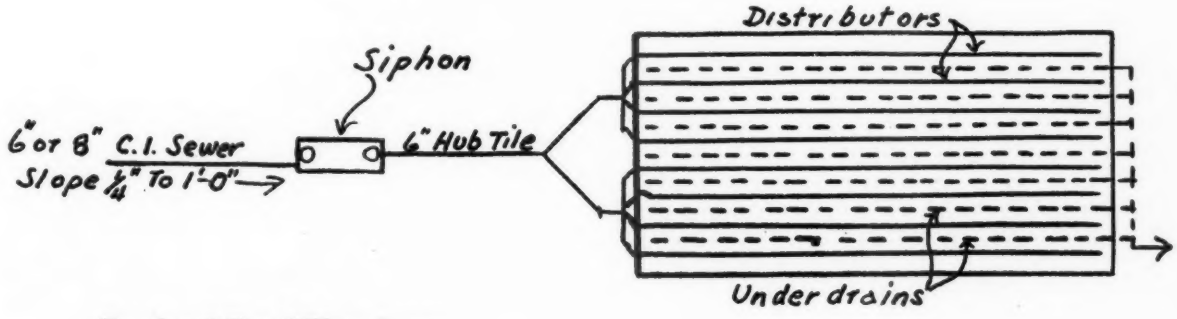
The sedimentation tank has proven the most practical method of disposal for this type of installation when the maximum flow of sewage is not over 20,000 gallons per day. These tanks are usually constructed of concrete or rust-resisting metal. Metal tanks present some advantages because they are permanently water-tight and cannot be damaged by frost or shifting of the foundation. The septic tank is usually divided into sludge and effluent compartments, the sludge compartment being approximately 2/3 the total capacity of the tank.

In selecting the location of the disposal system, the tank should usually be placed near the toilet rooms. The capacity of a septic tank is in direct proportion to the daily flow of sewage, and should be determined by estimating the average number of transients that will use the toilet facilities over a period of twenty-four hours, plus the number of persons regularly employed at the airport. A basis of five gallons per capita for transients and fifty gallons per capita for regular employees has worked out satisfactorily for these installations.

The capacity of the septic tank should be equal to the maximum flow of sewage for a period of twenty-four hours, unless the flow will be over 4,000 gallons. If it exceeds this, a twelve-hour retention period in the tank is sufficient and the capacity of the tank can be cut in half, not being less, however, than 4,000 gallons. For example, there would be a total flow of 8,000 gallons per twenty-four hours from an airport serving 1,0000 transients per day and having sixty regular employees. Since the total flow is more than 4,000 gallons per twenty-four hours, a twelve-hour retention period is adequate, and a septic tank with a 4,000 gallon working capacity should be installed.

In larger installations where the flow of sewage is estimated at more than 10,000 g.p.d. it is advisable to use a siphon dosing tank if the contour of the ground will permit it. This tank provides an intermittent discharge of effluent and is especially adapted for use with a sub-surface sand filter bed.

The location of the drainage field for receiving the tank effluent should be carefully considered. In the average type of soil, the effluent from the tank can be disposed of by absorption underground. However, in some soils that are impervious to water a sub-surface sand filter is necessary and the final



Plan of sand filter, 5,000 sq. ft. area

method of disposal of the filtered liquid should be carefully considered.

There are three common methods of handling the effluent discharge from the septic tank. 1.—A tile filter bed. 2.—A series of drainage wells. 3.—An artificial sub-surface sand filter. To determine the most practical method of disposal, a soil percolation test should be made in the area where the drainage will be located. Test holes one foot square should be sunk to depths two feet, three feet, four feet, or six feet below surface throughout the area where the drainage will be placed; if favorable soil conditions are encountered two to three feet below the surface, then it will not be necessary to test the soil any deeper. Fill each test hole with at least 12″ of water, and determine the average time it takes the water to fall one inch by making several readings. It is advisable to fill each test hole at least twice with water and the second reading will be the more accurate. With this information, the rate at which the sewage may be applied can be taken from the following table.

Allowable Rate of Sewage Application Per Sq. Ft. Per 24 Hours

Time for water to fall one inch	*Bottom area trenches*	*Percolating area cesspools*
1 minute	4.0 gallons	5.3 gallons
2 minutes	3.2 gallons	4.3 gallons
5 minutes	2.4 gallons	3.2 gallons
10 minutes	1.7 gallons	2.3 gallons
30 minutes	0.8 gallons	1.1 gallons
60 minutes	0.6 gallons	0.9 gallons

In a locality where the soil is so tight that subsurface irrigation systems are not practical, a subsurface sand filter should be used, provided a suitable outlet is available. The filter should be designed for a rate of filtration in ground at 50,000 gallons per acre per day. Filtering material should be clean, coarse sand and the filter beds should be at least 30″ deep. Both distributors and under-drains of 4″ agricultural tile should be laid in graded gravel and sloped approximately 1″ in 10′ toward the outlet. It is important that the filter bed be so planned that it will not be affected by surface water.

The lay-out illustrated shows a typical installation of a 3,000 gallon septic tank with a built-in siphon dosing chamber. Final disposal of the effluent from the tank is by an artificial sub-surface sand filter bed. This system would be adequate to take care of 800 transients and forty employees.

Hickory's Sewage Plant Rose Garden

Last year the new sewage disposal plant on the outskirts of Hickory, N. C., was an ugly landmark. Perched on a bare red bank overlooking Lake Hickory, it was an eyesore in the midst of many acres of potentially beautiful lakeside land which the city owned. Now the city council and Hickory citizens have turned this into a rose garden of breath-taking beauty. A further beauty was the fact that the garden was a community project, had cost the city not one cent.

The idea was presented by the Hickory Rose Society to the council in February. Public contributions of cash, plants, and materials would install the garden, the city would maintain it on city property, and "after the garden is established roses will be cut and delivered weekly during the season to each and all hospitals within the city . . . and the blooms will never be used for commercial purposes."

Not only will the roses help to give the citizens a favorable impression of the disposal plant, but sludge from the plant should aid in the cultivation of the roses.

Operating Percolating Filters in Series Experimentally in England

Experiments have been under way since October, 1938, at the Minworth sewage treatment plant of Birmingham, England, on the operation of two percolating filters in series, with the order changed once a week. The experiments were carried out by the Water Pollution Research Board of the Dept. of Scientific and Industrial Research. Three filters of the same size and receiving clarified sewage from the same source were used, one operating in the standard way for comparison with the other two operated in series.

The filters are 115 ft. diameter and each contains 2,300 cu. yd. of filtering medium 1″ to 2½″ diameter. The effluent from each passes through an upward-flow settling tank of 63,000 gal. capacity. In the experiments the effluent from the primary tank was settled before passing to the secondary tank. The sewage used in the experiment had first been settled. Its B.O.D. in dry weather was about 200 to 300 ppm. The B.O.D. of the effluent from the single filter varied considerably, at times reaching 30 to 40 ppm, but that of the final effluent from the two series filters was usually less than 10 ppm. Also, during the entire test the effluent from the single filter contained more solid matter in suspension than that from the double filtration, although the rate per combined volume of filter medium was greater in the latter than in the former.

It is possible that weekly alternation of order of filters is not the most effective period, and a semi-scale plant of 8 filters has been built in which to carry on the investigation.

The methods of testing and data obtained were described in a paper read July 3rd before the Institute of Sewage Purification by J. M. Wishart and R. Wilkinson. In concluding the paper, the authors say:

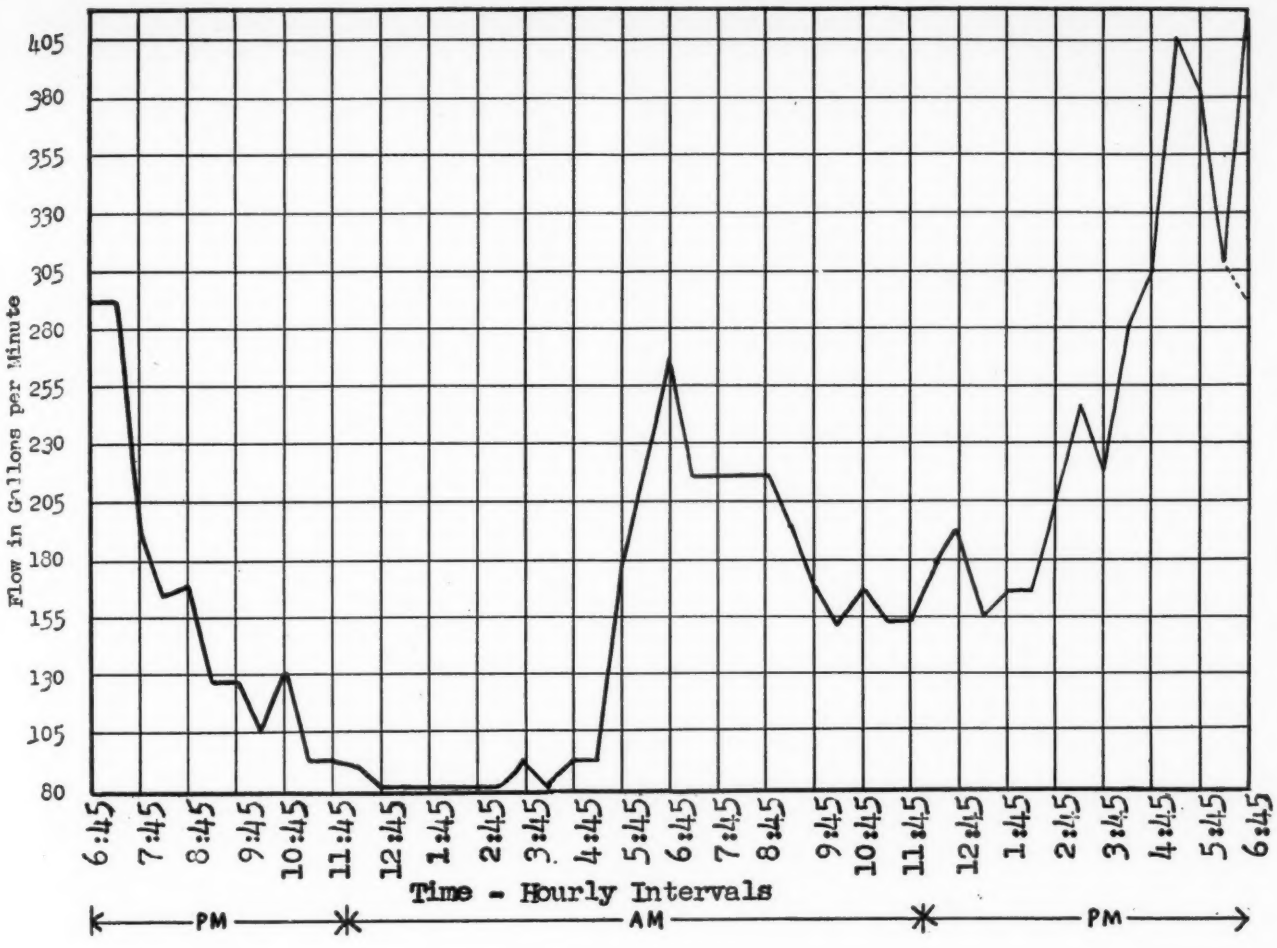
"The experiments on a large scale, which are described in this paper, have definitely proved that at least twice the volume of settled sewage per cubic yard of filtering medium can be efficiently treated by a new system of filtration through two filters in series, with periodic (weekly) changes in the order of the filters, as by the usual system of single filtration. In other words the capacity of two filters operated as single filters in parallel can be doubled by operating them in accordance with the new method of "alternating double filtration."

"In order to convert two filters from the system of single filtration to that of alternating double filtration, an additional humus tank is required to remove suspended solid matter from the effluent of one filter before this effluent is supplied to the other filter. A pump is also necessary to pump the effluent from the one filter to the other. The pipes and valves must be so arranged that each filter in turn can be used as the primary filter or as the secondary filter. The saving in cost of filters, however, is usually much greater than the cost of the additional humus tank and the cost of pumping.

"The new process of alternating double filtration is now in operation in several places for the treatment of sewage and industrial waste waters."

Another paper read at the same meeting by T. G. Tomlinson describes biological observations and experiments made on the filters described above. He found film at the surface of the filters including algae, fungi, bacteria and amorphous matter, which he de-

(Continued on page 53)



Water Supply and Sewerage at Army Camps

Data on which to base estimates of quantities of water consumption and of sewage to be provided for at Army posts. Analysis of data collected from five Army posts.

By CHESTER COHEN and W. C. GAUNTT

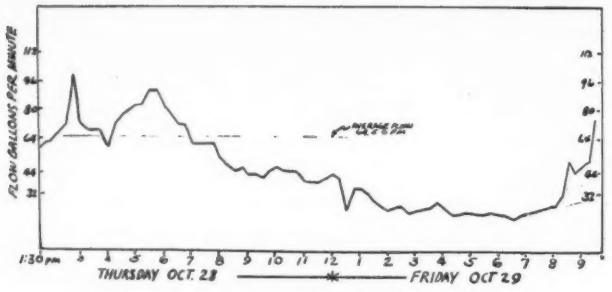
Engineer on Stream Pollution and Sanitary Engineer and Chemist on Stream Pollution, Texas State Dept. of Health

CONSTRUCTION and expansion for the Army and Navy are creating a heavy demand upon the facilities, both military and civilian, for housing, water supply and sewerage. In Texas, in January of this year, there were 21 Army camps and 2 shipyards under construction and extensive naval facilities and housing projects being built. This condition gives greater importance than ever to the inseparable trio—water supply, sewage treatment and stream pollution. It is difficult to maintain facilities for water supply and for sewage collection and treatment commensurate with the developments in the cantonment areas. The imported construction labor, together with their families and service personnel, constitute a greatly increased load on the adjacent municipal sewage plants and collection facilities. This must be reckoned as a part of the defense program, although it is a burden which is being inappropriately assumed by the municipalities.

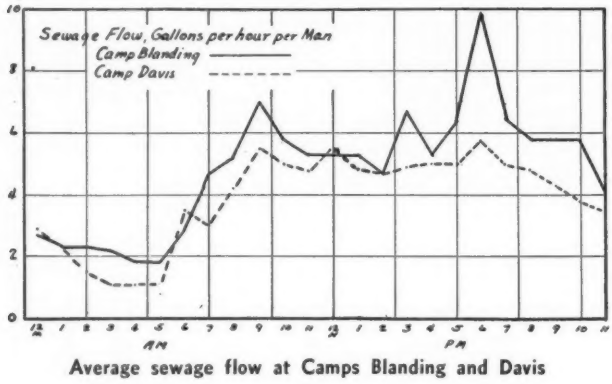
Due to the gradual lowering of the water table in Texas it may later become necessary for some of the Army and Navy installations to depend on a surface rather than an underground water supply; in fact even now some of them are having difficulty in obtaining an adequate supply from wells. Therefore the need for reasonably clean streams becomes increasingly urgent, and adequate treatment of sewage and industrial wastes a matter of prime importance.

In this connection it is important to know the water demands and the sewage flows to be expected at Army posts. To obtain some actual data on this point the Stream Pollution Division of the Texas State Department of Health has made surveys and collected pertinent data at several Army posts.

At one Army post under study, it was found that the water consumption during peak summer flows was 325 gallons per capita per day based upon the existing military strength of the post; at another 175 gallons per capita; and at still another a maximum sum-



Hourly variation of flow at Duncan Field



Average sewage flow at Camps Blanding and Davis

water consumption figures at this field and at the other three Army fields previously mentioned, probably can be accounted for by the second and third factors. There is, however, a fourth and last factor which, although somewhat intangible, is very real; that is, the matter of water discipline. It has been our observation that with proper water discipline the per capita usage of water in barracks can be reduced by as much as 30 to 40 gallons per man per day; also that recruits in barracks are more sparing of water than the seasoned soldier.

These matters deserve close scrutiny, for throughout the entire Southwest, the matter of water consumption is vital. In a cantonment housing 10,000 men, a difference of 30 gallons per man per day means 300,000 gallons per day, and in these areas of definitely limited water supplies, one-third million gallons of water per day may very easily spell the difference between an adequate water supply and one that is inadequate in terms of possible daily withdrawals from surface or ground storage reservoirs and water bearing strata.

In these studies, flow data were collected at 15-minute or 30-minute intervals (depending on personnel available) over periods of several days. Water usage was obtained either by metering or by pumpage; sewage flows were obtained with a 60° weir which had been checked with a stream flow velocity meter, and with actual tank elevation increases. Only the averages of data collected are given.

Table I—Water Usage and Sewage Flows at Five Army Fields

	WATER PER CAPITA				SEWAGE PER CAPITA			
Post	*Avg.*	*Min.*	*Max.*	*% Max. over Average*	*Avg.*	*Min.*	*Max.*	*% Max. over Average*
No. 1	151	105	234	155%	84	39	196	232%
No. 2	80	..	...	...	55	50	109	200%
*No. 3	88	..	135	153%	99	..	132	133%
No. 4	258	..	..	..	..	..	..	..
No. 5	115	..	..	..	90	..	..	..

*Water consumption and sewage flow data collected on different days.

mer consumption of 250 gallons per capita per day based upon the total military and civilian strength of persons on the post. Studies at this last post further showed that 93% of this total water flow was turned into the sewer system.

If, instead of the customarily assumed 60 gpd per capita, based on the average Texas municipality, we should provide 250 gallons, there would be, in the case of a cantonment for 20,000 men, a difference of about 4 mgd, which would mean an extra cost for construction of at least $175,000.

In an attempt to explain these differences, an exploratory usage study was made at an Army Air Field at which both civilian and military personnel are on duty, and no industrial wastes other than the negligible amount incident to military operations are produced. A preliminary study of the winter water consumption indicated that the demand was about 80 gallons per capita per day. This is a decided contrast with the other figures of respectively 325, 250 and 175 gallons per capita per day, which is explained as follows: In the first place, this is a permanent Army post of long standing, and no unusual amount of water is being required for irrigation of lawns or other beautification purposes, an important consideration in certain western areas where irrigation demand is a big factor. Again, this preliminary study was made during the winter months when low water consumption demands were encountered. There is a third factor which is probably of primary importance—that is, that at the time of the year this study was made, neither the swimming pool nor the laundry was in operation. A great deal of the difference between the

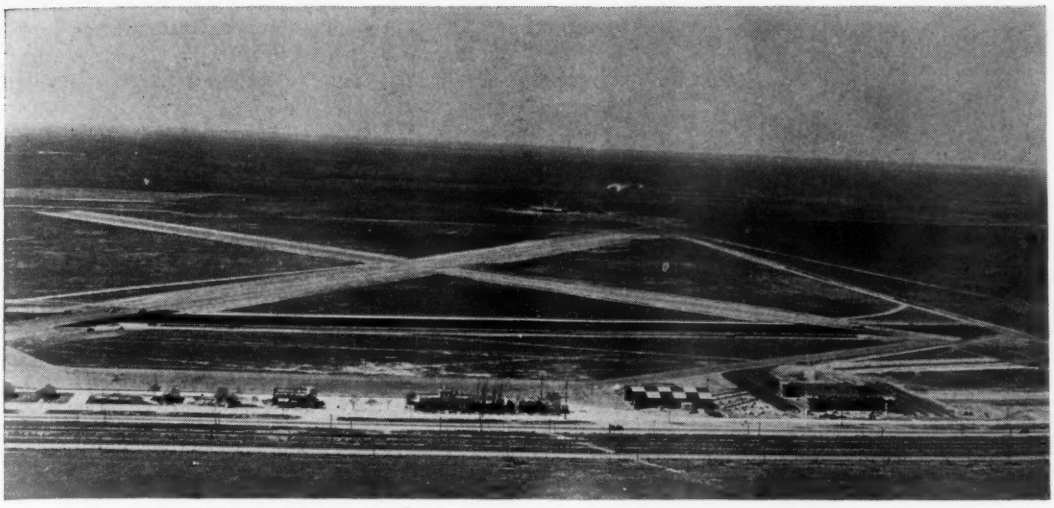
Sewage Flow Data

The sewage flow from new barracks and from officers and noncommissioned homes at Post No. 2 and Post No. 3 has been found to average 42 gallons per capita for the weekly period. It was found also that the maximum flow reading consistently occurred from 10:00 A.M. and 11:00 A.M., when the volume was 109 gallons per minute. This means that the maximum flows are more than 100% greater than the average flow; and they were not flash flows but persisted over a considerable period of time.

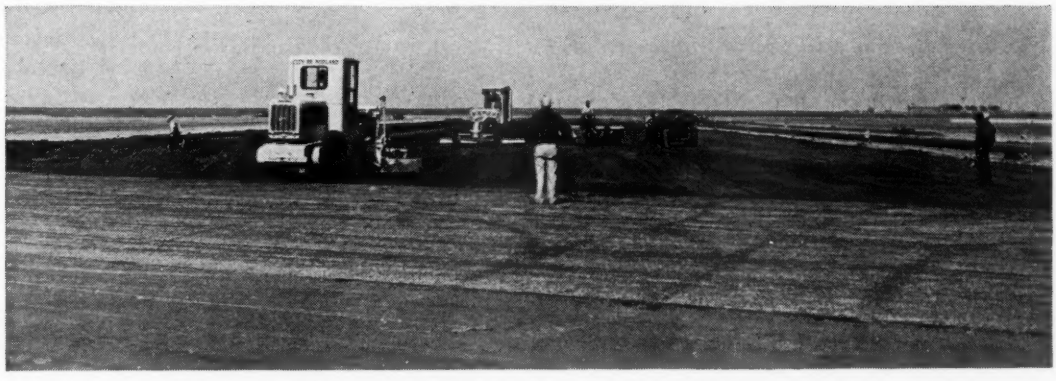
The average figure of 42 gallons per person per day for the officers and men living on the post seems to be conservative, but it is well in line with the experience of municipalities throughout this State where only domestic wastes, and not industrial wastes, constitute the sewage flow. It is likely that this figure of 42 gallons daily per capita will be materially increased during the summer months, due both to climatic conditions and to drainage water such as that from bathing and from swimming pool discharge. We believe that it would be wise to assume that this reading could

(Continued on page 48)

Air view of Camp Davis activated sludge plant. Digesters in foreground, sludge beds at left



General view of Midland airport. New hangar at right end. New runway in center



Spreading and rolling 5" stabilized emulsion base; to be topped with 1" triple course asphaltic penetration type

Constructing a Minor Army Airport in Texas

Included constructing runway 4,500 by 150 ft. by mixing asphalt emulsion with the soil for base, covered with a three-course direct-penetration wearing surface.

MIDLAND Airport, in the western part of Texas, has been designated as one of the Army airway stations to serve as a unit in the defense network of airports in the southwest, and is being enlarged and reconstructed.

The landing area of the field proper was enlarged by 105 acres. Improvements to landing facilities include the construction of a high type surface runway, 150 feet wide and 4,500 feet long, the laying of 9,335 square yards of high-type surface aprons, and extensions to taxi strips.

A modern, structural tile hangar, 120 feet square, also was constructed at Midland. Nine huge, timber bowstring trusses, each 121 feet and four inches long, were constructed on the project to support the roof. Each of these trusses weighed 14,000 pounds and contains 3,460 feet of lumber.

To provide for proper drainage of the field, complete new drainage systems around and throughout the field have been installed. This work included installation of 825 linear feet of 30 inch pipe, 800 feet of 27 inch pipe, 700 feet of 24 inch pipe, 1,200 feet of 21 inch pipe, and 1,950 feet of 15 inch pipe.

The construction of the 4,500-foot runway at the Midland field presents an interesting method for this type of runway.

The sub-grade was prepared in the usual manner. Carefully screen-tested stabilizing soil was hauled to the runway and windrowed with a standard windrowing machine constructed on the project. A traveling mixer was employed to mix an emulsion with the soil to be stabilized. The type of material used as a stabilizing agent was a special stabilizing asphalt known in Texas as State Highway Department Specification EA-10-S. After the mixing operation the windrows were spread by maintainers to aerate and allow the excess mixing water to be evaporated.

As soon as the mix became workable, the entire

Covering drain pipe next to new runway

mass was spread and shaped to grade. This stabilized base was then rolled for complete compaction by pneumatic rollers. Upon completion of the air curing of the base, a tack coat of asphalt penetration surface treatment, known as EA-12-Q was applied. Approximately .25 gallons per square yard was applied in this operation. A standard three-course direct penetration wearing surface was then applied, utilizing 1.2 gallons of this asphalt treatment per square yard.

This work was done by WPA labor, an average of 175 men being employed. WPA also contributed approximately $100,000 toward the cost of the work and the city of Midland provided $45,000.

Lead-Jointed Cast-Iron Pipe in New York

The illustration shows a 60-in. cast-iron water main which, after having been in service in New York City for 91 years, was moved slightly in position to make room for another structure, and continued in service. There is no record of there having been any failure of either the pipe or its lead joints during this period.

The organ "Lead," to which we are indebted for the illustration, quotes the engineer of the New York Dept. of Water Supply, Gas and Electricity who is in charge of construction for the Borough of Manhattan, as follows:

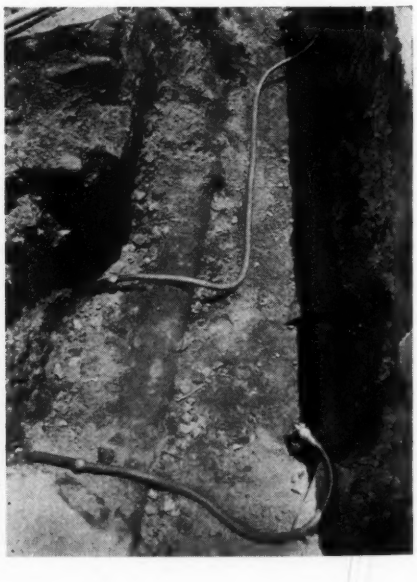
"We have a number of problems that are peculiar to this city and which must be carefully considered at all times. Manhattan is being constantly rebuilt underground as well as on the surface and all possible care is exercised to protect our water mains against any undue disturbances. The flexibility of the lead-calked joints in cast-iron mains takes care, to a considerable extent, of any movement of these mains without dangerously stressing the pipe itself. This same flexibility of lead protects the joints against the damaging effects of vibration which may be transmitted to the pipe from heavy overhead traffic. In a like manner, lead services easily stand up under vibration or shifts in the sub-structure.

"Lead-calked joints in cast-iron mains and lead services give us little or no trouble. We have 5,000 miles of cast-iron mains representing about 98 per cent of our water distribution system; connected to these mains are many thousands of lead services. It is remarkable how few failures of either lead joints or lead services are found.

"Every joint poured is supervised by a Department Inspector on the job. High pressure mains are tested to 450 lb., low pressure mains to 125 lb. hydro-static pressure. When we close the trench, we feel assured that the mains, short of unavoidable accidents, will need no further attention for decades to come."

A 60-in. cast-iron water main with lead joints in New York City installed in 1850. Despite its 91 years of continuous service no trouble with either pipe or joints has been recorded. Picture taken when the main was recently relocated slightly

Lead connections joining old lead services at left to a new main in New York



Producing CO_2 for Recarbonating at Columbus, Ohio

Carbon dioxide for recarbonating lime-softened water has been produced by burning gas, oil or coke, utilization of stack gas, and generation and use of producer gas burned under a boiler; in all of which the hot corrosive gases have been fed to the suction of a compressor or blower and pumped to the CO_2 diffusers in the carbonation chamber. The corrosive gases attack the valves, pistons and cylinder walls of the compressors, causing excessive wear and much trouble.

A unit was placed in operation last year at the Delaware, Ohio, 2 m.g.d. softening and filtration plant that reverses the order of pumping. In this, the compressor is placed ahead of the producer and the producer is operated under pressure, the pressure being approximately that due to the head of water over the diffusers. In this way the compressor handles only clean air.

This installation is working very satisfactory. Water that is circulated through the water jacket may be connected to a radiator, or may be utilized as a limited source of hot water. The coke is fed in the top of the producer and the ashes are taken out at the bottom. By using a forced draft type of producer it is possible to secure percentages of CO_2 ranging from 15 to 18%.

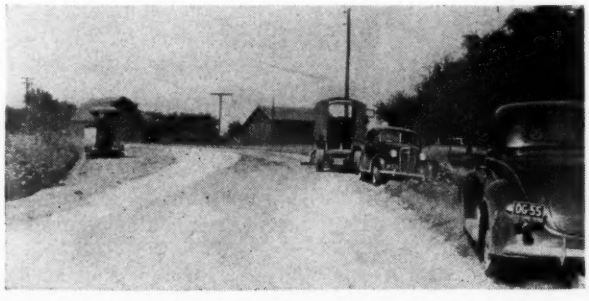
Widening and Surfacing Thirty Miles of Road, Using Tar and Asphalt Emulsion

By J. F. MOLLENKOPF
Former County Engineer, Van Wert Co., Ohio

Major J. F. Mollenkopf, Retired

IN Van Wert County, Ohio, about 50% of the county system has been treated with either tar or asphalt emulsion, and it was decided to treat thirty miles additional in 1940. The roads being not very heavily used, and level, it was thought that fourteen feet would be sufficiently wide for the top, with a berm about four feet wide, the object being to secure as cheap a top as possible, but one that would not require too much maintenance. These roads were all stone macadam pikes, originally built eight or ten feet wide. For the most part, the surfacing was on one side of the road (usually the edge of the macadam was along the center line), and had been well maintained prior to treatment. The side-ditching, to a great extent, had been done previously.

Some twelve miles of these roads were on a local WPA project for widening and berm building; the county, however, placed the bituminous top as its contribution. All the work was done by force account, using the regular county crew with a small number of extras as needed. The county equipment available for the work included:



Widening a curve by rolling No. 2 stone to match elevation of original highway

4 dump trucks (hauling about 5 tons per load)
3 motor graders (2 Galion EZY lift and 1 Road Hog) with ten foot blades
1 extra motor grader hired from the township
1 Galion EZY lift pull grader
1 AC 50-hp tractor, crawler type
1 10-ton Galion roller, equipped with water tank
1 Galion patch roller (water-filled, 42" tread)
1 800-gal. Littleford distributor
(This was used mostly to apply water when water was available for water binding)
1 Galion chip spreader
1 stone spreader

We hired the bituminous distributor, paying 0.9 cent per gallon to haul and distribute the asphalt or tar.

Extra trucks for hauling were paid 5 cents per ton-mile; this was above the current rate, but we insisted on controlling speed and loads. The only restriction to number used was that they be owned in the county, and only one truck per owner was hired as a rule. In the three years that we have followed this plan we have had no difficulty.

It was decided by the County Commissioners to use asphalt emulsion on fifteen miles, and tar (RT5 Ohio Spec.) for the remaining fifteen miles. The aggregate was limestone, of which we have a very good quality, available from five quarries in the county. No gravel is found locally, and so is not used. The widening was accomplished by opening a trench alongside the present roadway to about a 6-inch depth, and to a width of usually four to five feet. This trench was filled with 2-inch stones and rolled thoroughly; No. 7 stone was then spread on this surface and, when water was available, the distributor would wet this down, as in water binding, following up with more No. 7, rolled until well compacted. The entire top was so graded that the new and old parts were well united. The fine stone accumulating from the shaping was placed opposite the trench just off the metal. As soon as practical after the road had been shaped, it was given a shot of slow-curing asphalt (SC3) at the rate of one-half gallon per sq. yd., and

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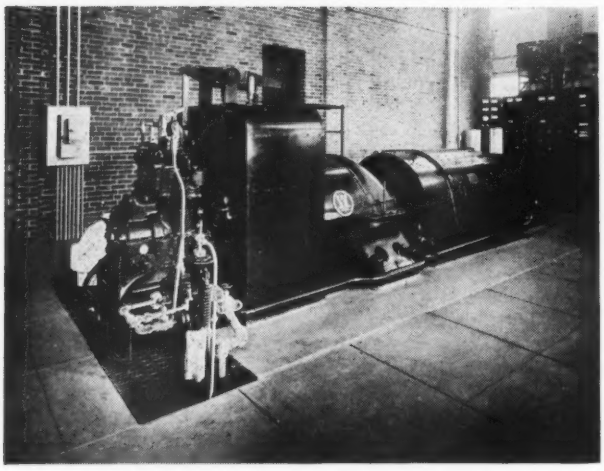
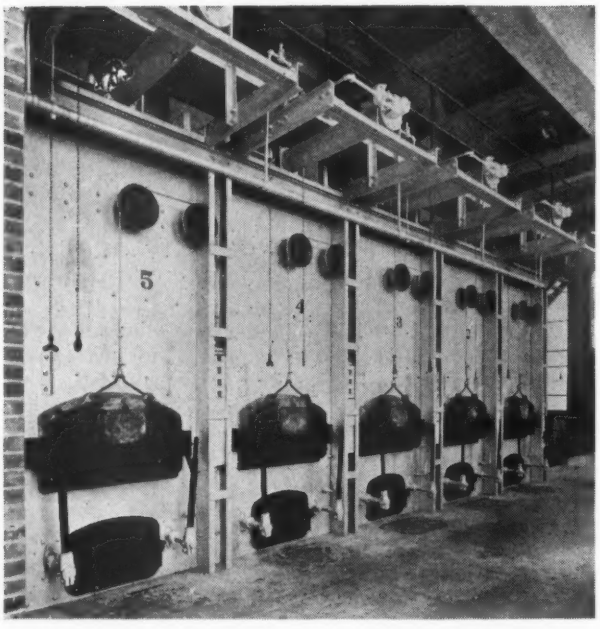
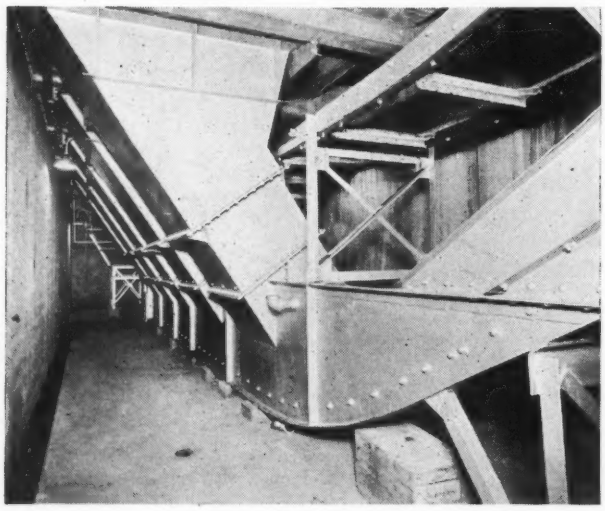
Cut from road in background used to make fill behind the camera



1250 KW Westinghouse turbo-generator



Stoking floor of incinerator. Pneumatic cylinders, chain operated, open sliding doors discharging refuse onto grates



Discharge hoppers from dumping grates to flight conveyors. Bottom of hopper immersed in water provides seal against air leakage and dust

Power From

By PHILIP E. HOLTON

Superintendent of Water Supply Board, Providence, R. I.

PROVIDENCE, RHODE ISLAND, began incinerating its refuse in 1926, using two 80-ton Decarie units. This plant was in service for ten years, but it made practically no use of the heat generated, power for operating the motor-driven auxiliaries being purchased from the local power company; and it seemed desirable to utilize the waste heat for power at the municipal plant and even sell surplus power to the local power company. This idea has now been carried out and the heat generated by a new incinerator is being used for operating the blowers that furnish air for the activated sludge plant built in 1936 and, since March of this year, in the complete motorization of the sewage pumping station. An unusual feature of this plant is the use of sewage plant effluent as circulating water in the condensers.

A comprehensive study of this idea was begun in 1933. The possibility of selling steam to manufacturers in the general vicinity of the old plant was considered, but their requirements were seasonal and the income therefrom would be insufficient. After many months of intensive study we were fully convinced that the existing plant could not be redesigned for power developments, for space for combustion chamber and waste heat boiler was not available, and furnace temperatures fluctuated hourly from a minimum of 300° F to a maximum of 1700° F, resulting from the cleaning of fires. Also the river on which the plant was located failed to provide sufficient condenser water during the low flow period. It therefore was decided to construct an entirely new incinerator plant designed especially for this purpose, and located on a new site where abundant condenser water would be available.

Meantime changes of the sewage treatment plant to use the activated sludge process were being planned. This would require installing three blowers each producing 12,500 cu. ft. of air per minute at 7 lb. pressure, two of them to operate 24 hrs. daily, to produce the maximum demand for aeration, 25,000 cfm, requiring 600 kw for rotary type blowers, power for which, purchased from the local power company, would cost $72,000 a year. Also plans for the new sewage pumping station, now in operation, provided for two 60 mgd pumps and two 40 mgd, providing the necessary flexibility to operate under the different load characteristics during both dry flows and peak storm flows reaching a maximum of 140 mgd. The cost of power for operating these pumps would be $41,000 a year. If power for this sewage station could be furnished by the incinerator plant the city thus would save $113,000 annually, a sum far greater than earnings derived through the sale of power. Also, if

Incinerator Used by a Sewage Plant

Heat generated by incinerator is used for operating blowers for activated sludge treatment and all pumps in the sewage treatment plant. Sewage plant effluent is used as circulating water in the condensers.

the incinerator plant be located near the sewage plant, two sources of condenser water would be available—water from the bay on the shore of which the sewage plant was located, and effluent from the sewage plant. This site therefore was adopted, and effluent was chosen for condenser water. Over 3,000,000 gal. of effluent is used daily as circulating water, being pumped back to the condensers from the effluent channel.

Plans for carrying out this idea were completed and a contract awarded to the Hiler Engineering & Construction Co. of Pittsburgh on July 26, 1935, for the incinerator units and all the power plant equipment for the sum of $476,000. This plant started operation on August 10th, 1936, with the old incinerator carrying part of the load until September 28th, to allow time to revise the refuse collection methods; after which all rubbish was brought to the new plant and the old one discontinued. During this period the crews were trained to operate the new furnaces and competent turbine operators were trained by factory experts and engineers furnished by the contractor.

Description of the Incinerator Plant

The incinerator is a 5-cell mutual assistance type, top feed, capacity 160 tons of refuse per day with 25% continuous overload. Each cell has a steel charging gate, dumping grate, clinker and ash pit door and a separate ash hopper, but the fire bed is continuous for all five. The lining above grate level is of fire brick 13½″ thick backed with 4½″ of insulating brick. The roof of the burning chamber is a flat suspended arch of 9″ fire brick.

The refuse, which is collected by the city in 17 dump trucks, is dumped into a concrete storage pit capable of holding 1,000 cu. yd., from which it is lifted as needed by means of a 3½ ton traveling crane with a 1½ cu. yd. grab bucket and dropped into one of the 2 cu. yd. charging hoppers; from which it is

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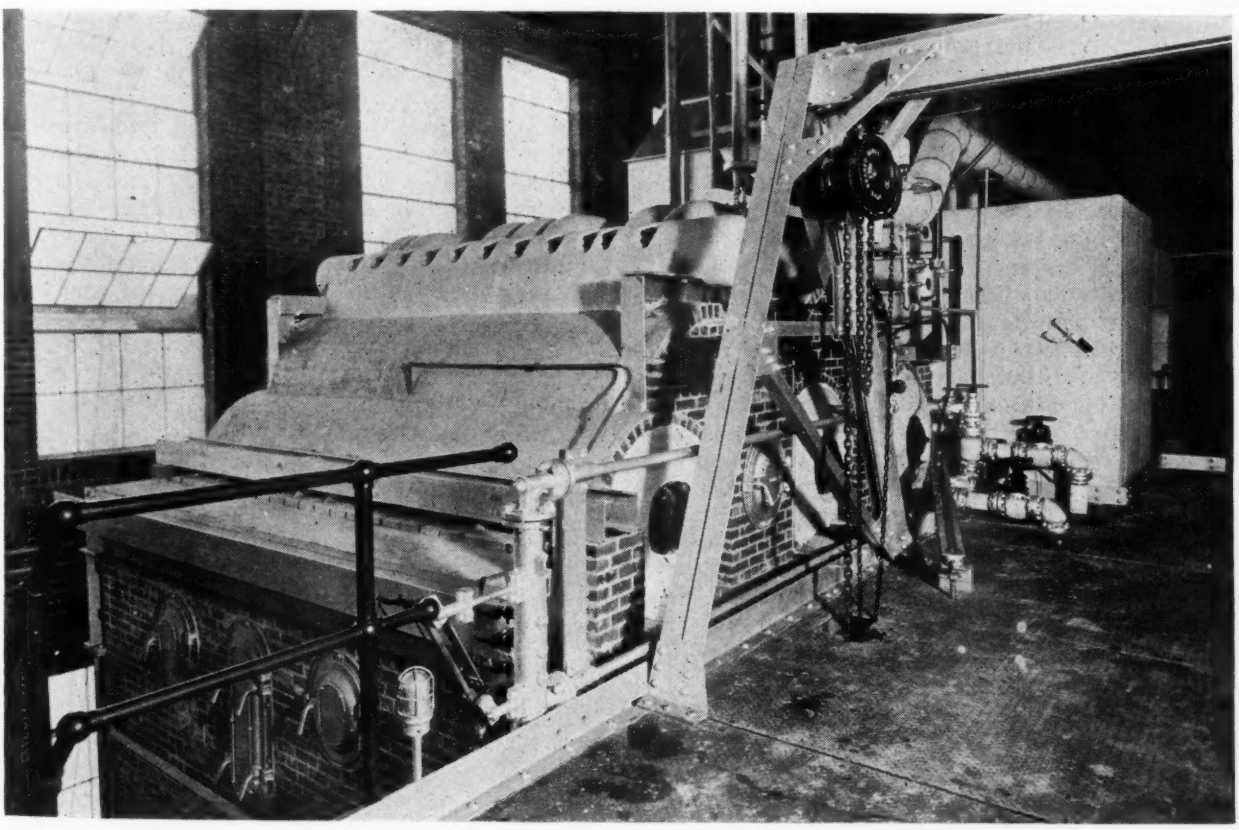
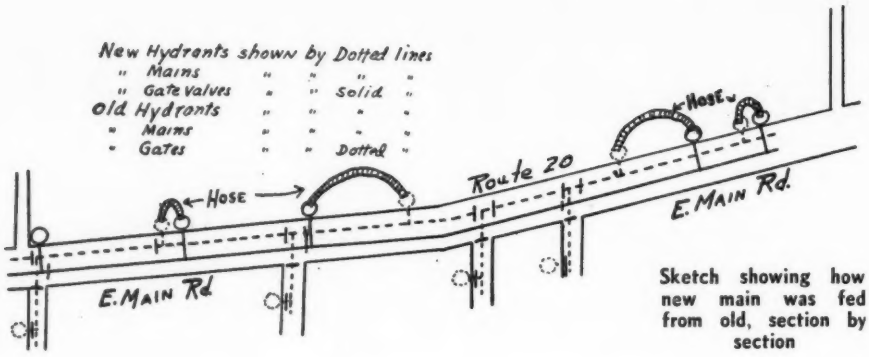


700 H. P. Babcock & Wilcox Sterling type boilers, 225 lb. working pressure

Lee Harvey



Sketch showing how new main was fed from old, section by section

Moving a Water Main in Conneaut Without Discontinuing Service

By LEE HARVEY
Superintendent Municipal Water Dept., Conneaut, Ohio

EARLY in January, 1940, the Federal Government advised the Water Department of Conneaut, Ohio, of its intention to widen the pavement of Route 20, which crossed the Conneaut river to the Pennsylvania state line, from 24 ft. to 44 ft. This necessitated the removal, before the new pavement was laid, of all water mains to a location at least two feet outside the new pavement and all fire hydrants at least six feet outside; all service pipe to cross under the pavement in conduits; all joints in cast-iron pipe crossing under the pavement at street intersections to be both calked with lead and also provided with bell joint clamps so that vibration would not cause leaks at these joints.

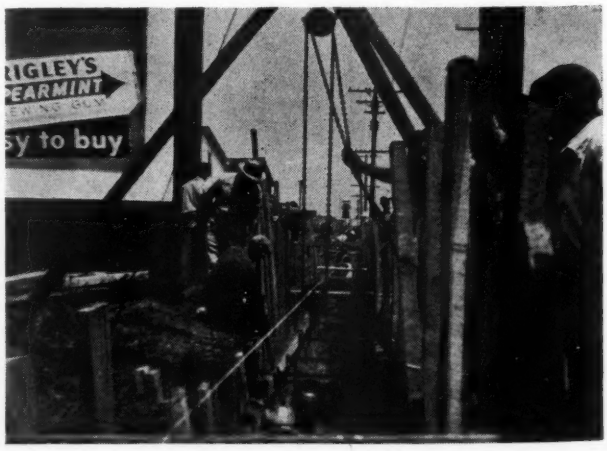
This involved laying 5,000 ft. of 8" main, 19 gate valves, 12 fire hydrants and 105 service connections totaling 4830 ft. There was already in the road an 8" main serving approximately 800 people, which service as well as fire protection had to be maintained, and the old main removed. This line was a dead end, which added to the difficulty. Additional complications were the fact that the Electric Co., Gas Co. and Telephone Co. were also moving their pipes and conduits at the same time, and a large trenching machine was being used in installing a storm sewer in the center of the right of way; the soil here is gravel and very fine sand, requiring sheeting the entire length of trench, which varied from 6 ft. to 8 ft. depth; and the road was bordered with maples and elms 3 to 3½ ft. in diameter which had to be removed. The storm sewer was at such depth that the majority of the services had to be placed under it in order to have them below the frost line. Finally, since this was an important highway, it was necessary that two lanes of traffic be free at all times.

The big problem was to furnish the consumers and contractor with water at all times, together with adequate fire protection. The dead end of the water line was selected as the starting point. The new main was located about eight feet from and parallel to the old main. The procedure was to lay the new main with the new fire hydrants to a point where a gate valve could be installed, then make cross connections with fire hose from the old to the new hydrants and then transfer all service connections in this section to the new main after it had been thoroughly sterilized. The old pipe was then removed up to the point where there was a gate valve in the old pipe. This procedure was repeated time after time until the job was completed.

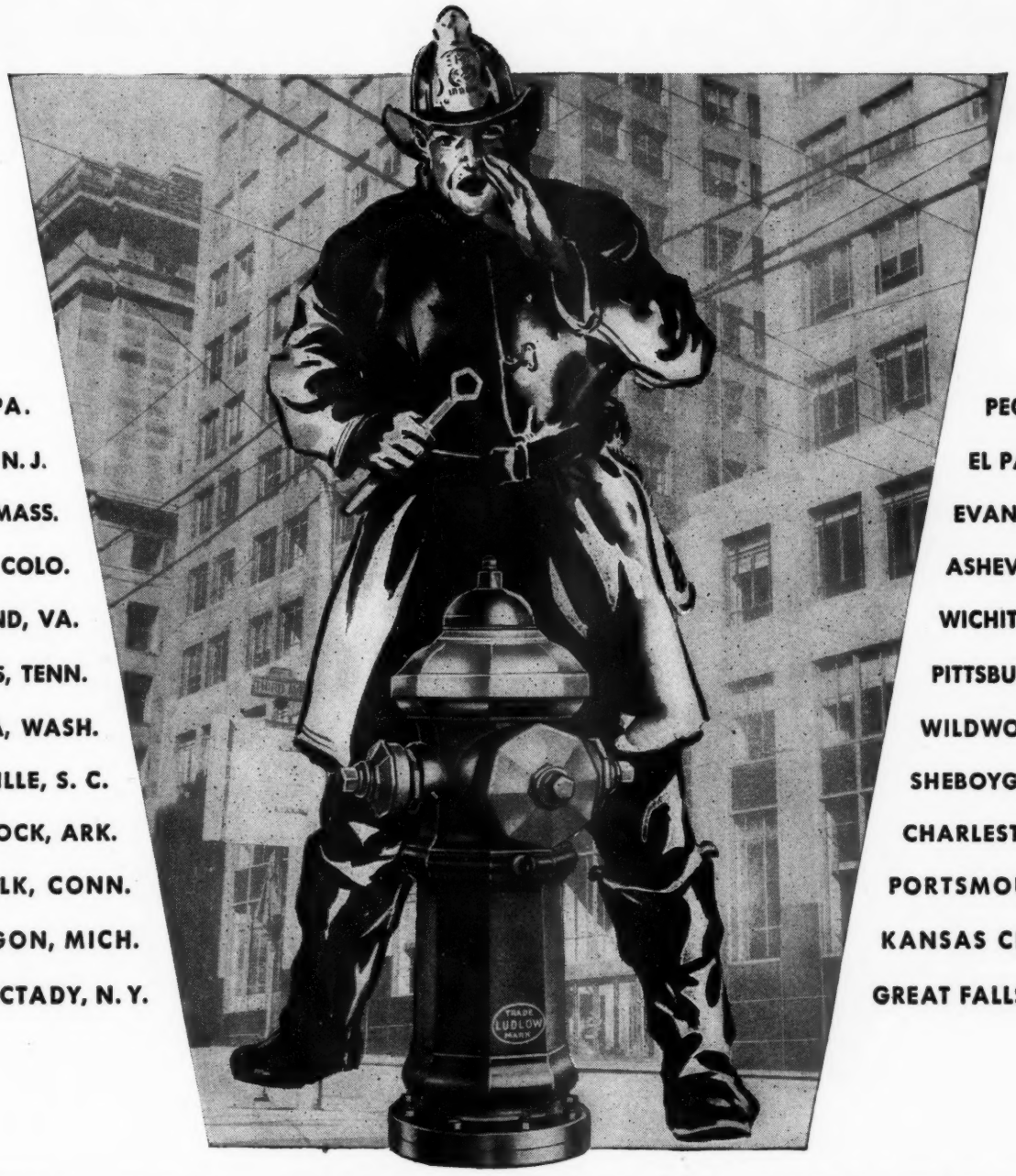
As only one half of the pavement was removed at a time, we dug a trench for one half of the length of each service pipe and then tunneled the remaining 22 feet with 4" tunneling spoons, inserting conduit and service at one time and completing the service to the consumer.

Before he could build two lanes of traffic, the contractor was compelled to remove many large trees and it was quite essential that the water department have their work all completed so that the paving contractor would not be held up. Every four inches of backfill was tamped with a compressed air tamper. The state highway inspectors followed up and made compaction

(Continued on page 50)



Laying new main in 6 ft. to 8 ft. trench



YORK, PA.
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LOWELL, MASS.
DENVER, COLO.
RICHMOND, VA.
MEMPHIS, TENN.
TACOMA, WASH.
GREENVILLE, S. C.
LITTLE ROCK, ARK.
NORWALK, CONN.
MUSKEGON, MICH.
SCHENECTADY, N. Y.

PEORIA, ILL.
EL PASO, TEX.
EVANSTON, ILL.
ASHEVILLE, N. C.
WICHITA, KANS.
PITTSBURGH, PA.
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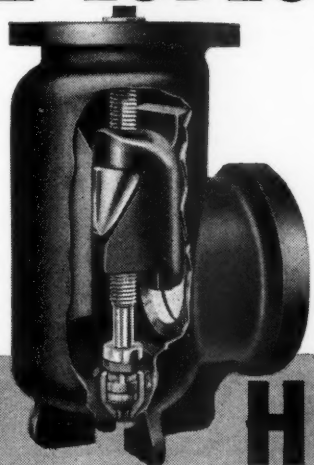
On Guard in these and other cities, Ludlow Hydrants insure complete security winter and summer, year in and year out. The famous slide gate principle, developed and perfected by Ludlow, provides *quick water* with least possible shock; proper shut-off without water hammer. Drainage at lowest point prevents freezing; wedge locking gate prevents flooding . . . Write for a free copy of Catalog No. 201.



LUDLOW DOUBLE GATE VALVES

One inch or 60 inches, the parallel seat, double disc-type slide gate valve, developed and perfected by Ludlow, has been the universally accepted construction in all water works valves for nearly three-quarters of a century.

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When you need special information—consult the *classified* READER'S SERVICE DEPT., pages 69-71

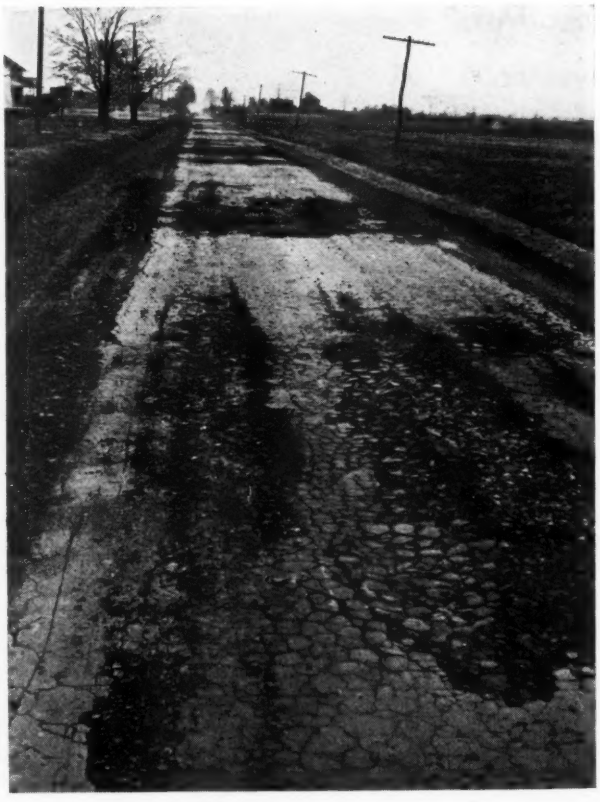
Surface Drainage and Subdrainage for Highways

The advantages of each and suggestions for designing drainage systems to meet different conditions. Where ditch velocities are less than 5 feet per second and where they exceed this.

EXPERIENCE with all types of pavement surfaces has emphasized the fact that adequate surface drainage and subdrainage of highways is necessary and is also a wise expenditure of money. Surface drainage should remove as quickly as possible all surface water from the entire roadway and discharge it into suitable outlets which carry it away from the highway. Subdrainage should lower the water table by controlling ground water and thus prevent the damaging of the pavement surface by a supersaturated subgrade in temperate weather or by the action of ice in the subgrade in colder weather. Subdrainage should not only lower the water table but should lower it sufficiently that no damaging effect may take place because of capillary action. In order to accomplish this it is necessary to work with the aid of a soil profile that gives complete information on each type of soil to be drained. A soil profile is not necessary if the engineer in charge of the work is well acquainted with different types of soil. The information given by the profile should extend to a depth of 2 to 6 feet. The depth of the drain will be determined largely by the type of the soil.

Equipped with a soil profile it becomes necessary only for the designing engineer to make a complete investigation of surface drainage conditions and then combine the two into one drainage system located beneath the side ditches.

Present tendencies in highway construction are to



Above—Lack of subdrainage is costing millions of dollars every year.

Below — Eliminate deep, open ditches with proper drainage and reduce accidents.

THE DEFENSE PROGRAM DEMANDS:

1. Proven Materials

2. Speedy Construction

3. Lasting Durability

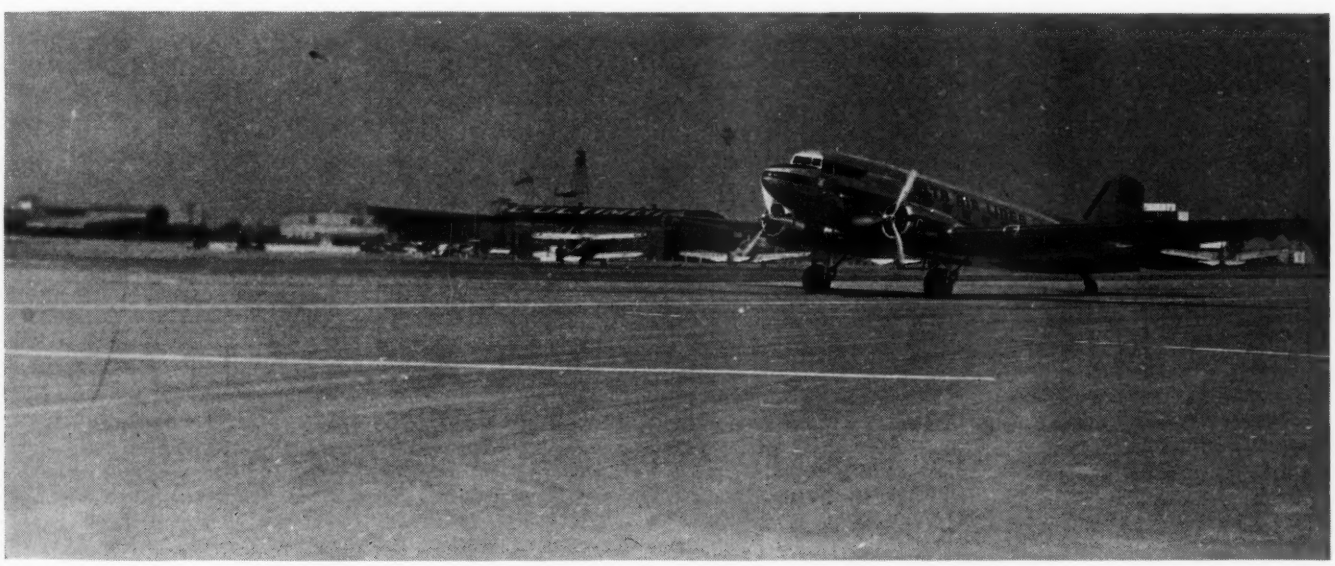
4. Sound Economy

❶ **PROVEN MATERIALS:** Over ten years service under all traffic conditions has proven the merit of Colprovia mixtures. They have been used in increasing volume by federal, state and local authorities.

❷ **SPEEDY CONSTRUCTION:** Colprovia mixtures are manufactured, by both cold and heated processes, at modern local plants of large capacity. They are easily and quickly spread in all seasons of the year by means of standard spreading devices or by hand to a perfect surface without joints.

❸ **LASTING DURABILITY:** Colprovia surfaces are permanent—not temporary. They have been recognized as the standard dense cold-laid pavement for many years. They are non-skid, stable, and are not affected by climatic conditions.

❹ **SOUND ECONOMY:** Colprovia surfaces are not expensive in initial cost. They are laid with minimum expense and give maximum spread per ton. They are not to be compared with temporary materials, the maintenance of which will be a burden to the taxpayer after the emergency is past. Most communities can save money by specifying asphalt mixtures made by Colprovia Processes for every paving requirement.



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COLPROVIA ASPHALT SURFACE MIXTURES

for Airports and Roads Preeminently Meet These Demands!

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A combination system of surface and subsurface drainage is necessary to solve adequately the complete drainage problem.

make the side ditches as shallow as possible, for the following reasons:

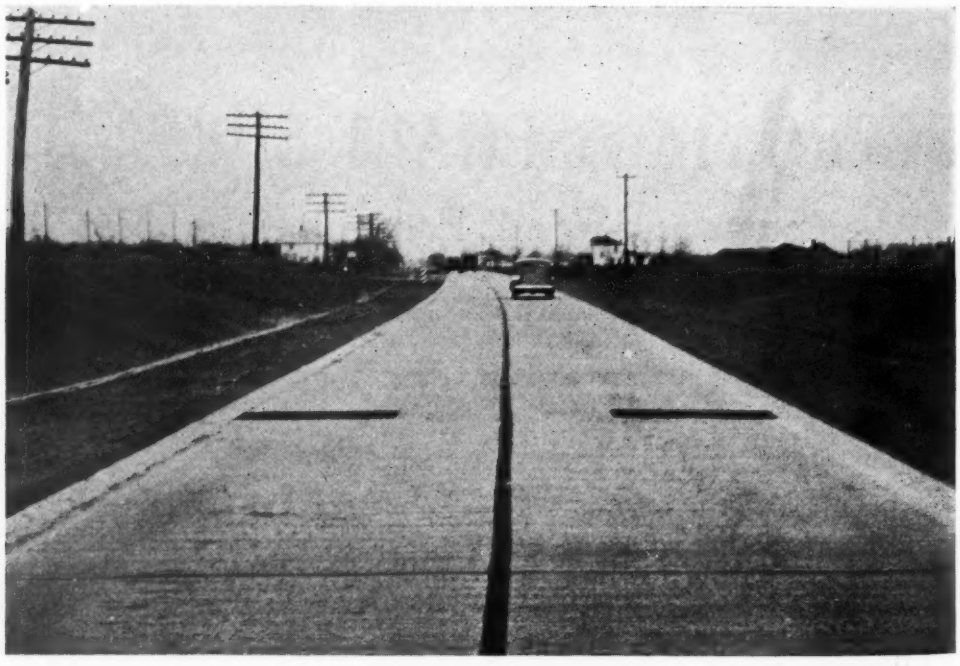
1. Deep open ditches are a hazard to present-day fast moving traffic.
2. Deep open ditches are unsightly.
3. Deep open ditches are costly to maintain.

For Ditch Velocities Less than 5 ft. per Second

In designing the highway of today with the shallow ditch, wide berm and gentle slope from berm to ditch bottom and a flattened back slope, much more runoff from the highway proper must be taken care of than in years past. The open ditch capacity of today has probably been cut to one half or one third of what it was formerly, therefore, in order to resort to the shallow ditch design, additional carrying capacity should be provided for the surface drainage.

This may be done most economically by the installation of drains under the bottom of the side ditches, and permitting the surface water to enter these drains through catch basins. This method eliminates the surface water almost as fast as it falls, lowers the water table below the frost line and reduces heaving and destruction of the pavement to a minimum. Catch basins are recommended instead of inlets in order that suspended material in the surface water may readily be cleaned out at the catch basins without injury to the system. For these tile lines to perform with maximum efficiency in lowering the water table it is desirable that they be straight and on a true grade. The most satisfactory tile pipe of this description is Extra Quality A. S. T. M. drain tile, as this type of pipe, unlike ordinary land tile, will not crush under usual loadings.

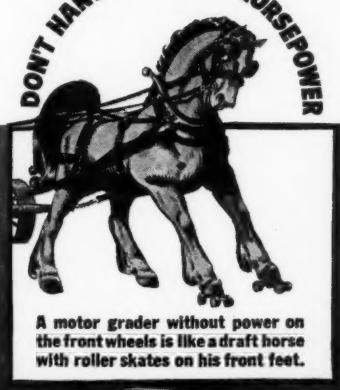
A deep root, pliant grass growing thickly over the ditch bottom will not erode from runoffs reaching a velocity of less than five feet per second. Such ditches underlaid with drains would solve the vast majority of problems of stable ditches, lowering the water table, eliminating capillary troubles and disposing of the



Ditches underlaid with drain tile solve the drainage problem, lowering the water table and removing the surface water.

MORE WORKING WEIGHT

. . . PUTS THE "99-M" POWER GRADER 'WAY OUT IN FRONT ON VARIETY *and* VOLUME OF YEAR 'ROUND PRODUCTION



A motor grader without power on the front wheels is like a draft horse with roller skates on his front feet.

● The ability of an A-W "99-M" to hustle from job to job . . . work in bad weather and difficult soil . . . do the work of two, three or more "part time" pieces of equipment in addition to all regular motor grader jobs . . . pays you an EXTRA WORK dividend of at least ONE MONTH each year.

This year 'round superiority of the "99-M" is largely due to the fact that—figured in terms of live tractive weight—it is the HEAVIEST motor grader on the market. There are no idling front wheels—carrying dead weight—to waste horsepower and limit its range of useful work.

Snow plowing provides one of many instances where the greater working weight of the "99-M" pays extra dividends. With powerful traction on the front wheels, plus steerable rear wheels, the "99-M" has unmatched bucking ability and control of direction. It successfully overcomes sidedraft; does not tend to skid into the ditch; follows curves and sharp intersections.

Ask for a demonstration and see for yourself what the "99-M's" greater working weight means in terms of year 'round performance, power saving, and extra range of usefulness. THE AUSTIN-WESTERN ROAD MACHINERY CO, Aurora, Ill.

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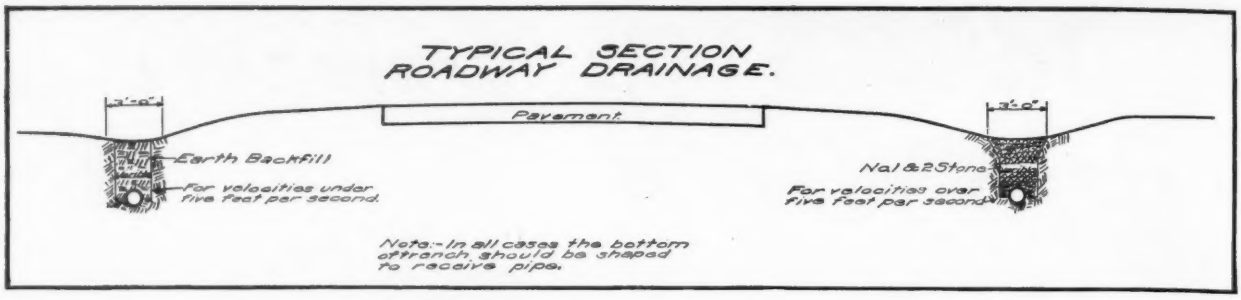


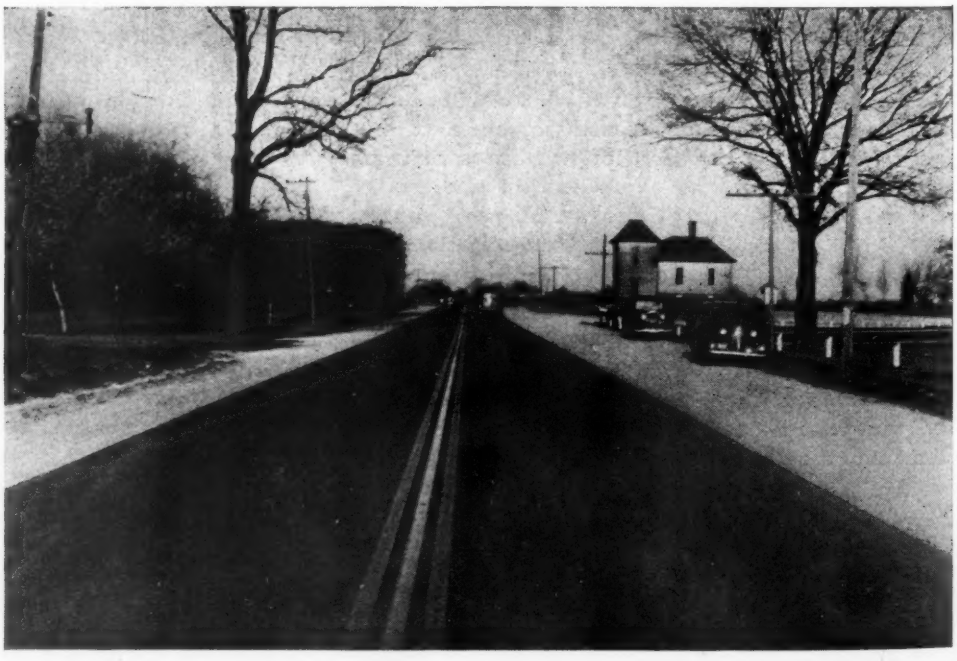
On roadway sections where the velocity in ditches exceeds 5 ft. per second, roadway drainage can be placed beneath the ditches and backfilled with a porous backfill.

surface water. However, there are always special cases where additional lateral drains will be necessary, as in the treatment of unusual soils. The spacing of catch basins and the size of tile must be determined by the area to be drained, the gradient of the ditch and tile, and the percentage of runoff. These data are computed as for any storm water system.

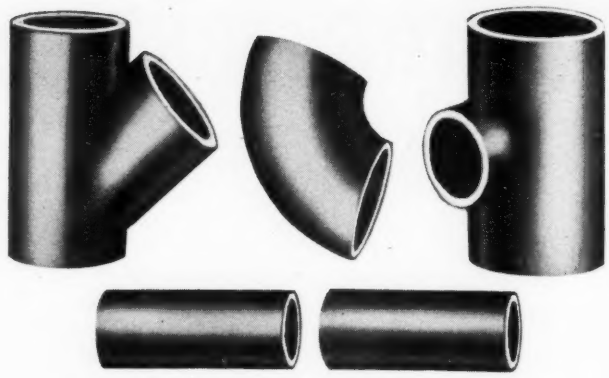
The depth of drain should be sufficient to provide as near thirty inches of cover as possible; however, it is obvious that the depth must vary in accordance with the irregularities of the terrain. Pipe less than 8-inch should not be used, as the slight difference in cost between six- and eight-inch is so small and the insurance afforded by the quick runoff of surface water is such that the additional cost involved in using the larger pipe is money well spent.

Great care should be exercised in determining the required size of pipe. First the areas to be drained should be carefully computed, next the percentage of runoff should be worked out in detail by classifying separately the areas with different vegetation, more or less slope, wooded, barren, etc. For instance the runoff from a barren roadside will be much higher than that from a roadside rank with vegetation provided, of course, that the soil is similar. It is frequently necessary to consider the adjoining areas, as the lines must serve these areas as well as the highway right of way. Velocities of at least 1½ feet per second are desirable, and a minimum of 2 ft. per second is preferable. It is much better to design the drains a little oversized, and to increase the velocity rather than to create such a sluggish flow that the system is

(Continued on page 38)



Proper roadside drainage permits complete roadside improvement, greatly increasing the appearance of the highway.



Drain tile fittings should be used to make connections.

not self cleansing. In flat prairie terrain, suitable outlets usually present the outstanding difficulty in any drainage problem. Therefore any outlet, but more particularly in such terrain, should be thoroughly investigated and suitable outlets should be created if not available. Any drainage system can be efficient only if its outlets are free.

For Ditch Velocities Over 5 ft. per Second

On roadway sections where the velocity in ditches exceeds five feet per second, roadway drainage can be placed beneath the ditches and backfilled with a porous backfill. Before the drains are placed in the trench, the bottom of the trench, for a depth of three to five inches depending upon the size of the drain, should be shaped to receive the pipe. In some soils a special tool works very well for this purpose. Shaping the bottom of the trench should always be done but should be particularly done when using a porous backfill. The material used for backfill should be fine aggregate up to about six inches above the top of the pipe and the remaining backfill to the surface should be 2- to 3-inch stone. The top foot of the backfill should be flared out as shown in the sketch on page 36.

With such an arrangement it is possible to remove surface water without erosion on nearly any grade that might be encountered. The surface water immediately upon entering the roadside ditch passes through the porous backfill and into the pipe without permitting ditch erosion. It is recommended that enough catch basins be constructed on this type line so that maintenance crews can have access for cleaning. Ordinarily this type of construction is not desired except in cases of high velocities in the roadway ditches; however it is difficult to set up hard and fast rules for drainage problems and this system might be applicable in some cases of low-velocity ditches.

Free use by the designer of pipe specials such as bends, wye branches, etc. should be resorted to rather than depending upon the constructor to build makeshift connections. A compact, well designed, well constructed drainage system pays for itself in short order.

Soil profiles are invaluable in the design of roadway drainage. The presence of water-bearing subsoil must be known and provision must be made to lower the water table in such soil in order to create a stable subgrade; but a soil profile alone is not sufficient, as it tells you nothing of the surface water conditions, and since the more practical fadeaway ditch is too shallow to afford sufficient carrying capacity, in most cases it is necessary to provide proper drains.

Since this is a combination drainage system that

(Continued on page 41)

will take care of both surface drainage and subdrainage for most highway problems, it is necessary to make a thorough study of the surface drainage conditions as well as the subdrainage conditions to adequately solve the complete drainage problem.

The advantages of roadside drains below the side ditches may be summed up as follows:

1. Eliminates deep open ditches.
2. Gives the roadway the maximum protection against a wet or frozen subgrade.
3. Provides fully against the possibility of damage to the subgrade from capillary action.
4. Removes surface water from the roadway in the shortest possible time.
5. Permits complete roadside improvement, adding greatly to the appearance of the highway.
6. Can be installed on any existing highway without interruption to traffic.

In summarizing the above-mentioned advantages gained by subdrainage, all are important, but the most important is the lowering of the water table. There is no base better than a clay base if this is always dry. By drying a road base the life of a road can be doubled and tripled. This is accomplished by eliminating water from an otherwise saturated soil, which water may freeze, expand and cause the disastrous heaving which breaks up roads every spring and costs millions of dollars in maintenance.

In the foregoing it has been the intention to discuss in a general way roadside drainage and a few of its advantages. Two general types of drainage systems have been mentioned, one for ditch velocities of under five feet per second and one for velocities of over five feet per second. It is not the intention of this article that these types should be adopted as a fixed rule, for each drainage problem affords its own peculiarities and deserves individual solution.

Construction of Sewer Excavation Subcontract

In an action by a subcontractor on a subcontract for the excavation of a sewage treatment plant and sewers against the contractor and its surety to recover a balance due for work performed under the subcontract, wherein the contractor filed a counterclaim, the Pennsylvania Superior Court (City of Farrell v. H. Platt Co., 15 Atl. 2d 718) said that "A general contractor frequently undertakes items knowing he must perform them at a loss on the particular items, with the expectation that other items on a more favorable basis will outweigh the disadvantage. Where, however, as here, a subcontractor undertakes to excavate at a unit price, it should not be held that he bound himself to incidentally perform, without compensation, an additional task the ordinary compensation for which exceeds that for the work expressly undertaken—unless the words of his contract clearly so imply."

The contractor's contract with the city called for earth excavation at $1.50 per cubic yard. The subcontractor agreed under its contract to perform the "excavation, back filling, tamping pipe and fittings" at 75 cents per cubic yard. It was held that the subcontractor was not required, under its contract, to repave the excavated trench, the cost of which would have far exceeded the cost of excavation.

Racine Water Works Improvements

(Continued from page 17)

20-inch and a 24-inch crossed this river, the latter crossing the harbor to 26 feet below datum or lake level. A great deal of money had been spent on repairing this crossing, but there was still a measured leakage of 200,000 gallons per day, therefore it was decided to replace this crossing with a 30-inch line a block away to connect the transmission line from the pumping station to the high-value mercantile district. As the War Department required a minimum depth of 37 feet to the top of the pipe and the channel was only 18 feet, a reinforced concrete tunnel was constructed and the main built in it.

Borings indicated heavy clay for the most part with some streaks of water-bearing sand and gravel, and this proved later to be substantially correct. The contractor performed all the work without resorting to the use of air, although he made provisions for the installation of locks and had the necessary compressors and accessory equipment on the site.

The section adopted was a horseshoe, 6′ 6″ high inside and the same width at the spring line. The floor was 12 inches thick and the arch 9 inches. The top of the concrete was 37 feet below water level at the highest point, the tunnel sloping downward two feet from south to north, at which point a sump was provided for unwatering operations. Vertical shafts 10 feet inside diameter were constructed at each end, in which vertical 30-inch cast iron risers were located 385 feet apart. All work on the tunnel progressed from the north shaft. The specifications called for placing 385 bags of cement in grouting, but conditions required the contractor to use over eight hundred to meet the specifications for water tightness. As the tunnel is to be kept filled with water, further expense in grouting was not considered of sufficient value to justify it. In sinking the shafts the contractor used sectional steel lining and wood forms for the inside. In the tunnel the same type of steel shield was used and sectional steel forms inside, the work being done in 10′ 6″ sections. All concrete was vibrated.

At each end of the pipe line a 24-inch manually operated cone valve was placed between long pattern reducers. The small loss of head through valves installed in that manner was such that the additional cost of 30-inch valves was not justified. Upon completion of the line there was no observable leakage at the joints at 100 pounds per square inch.

5. A 24-inch cast iron intake was constructed in 1886 from a point about three-fourths of a mile off shore, but had been out of service since 1933 due to the change in location of the pumping station. As it crossed the bay at a point not far from the shore shaft of te 36-inch intake, a connection to it was made at that point. This, of course, was marine work, six pieces of pipe being assembled on shore and taken to the site on a barge, lowered with derricks and the Thacher type joints caulked by a diver. The line was 755 feet long, laid in a trench excavated in the lake bottom. An interesting side light was the fact that a rod from one of the original Tracher joints was brought up and the nut could be unscrewed with the fingers after fifty-six years. No corrosion was apparent, due to the protecting coating of sand and clay.

This connection provides two intakes and reduces

the suction head on the pumps by 1.7 feet below the head when only the 36-inch intake was in use. Piping connections are such that the flow can be reversed in either intake, the other being used. This is a safeguard in case ice trouble is encountered, but little is anticipated in view of past experience, as the cribs are in about forty feet of water.

6. As a balance on the distribution system, a 2.75-million-gallon standpipe was built in 1931 about four miles from the pumping station. Studies made at that time indicated that 1.5 million gallons of storage was desirable, but the elevation of the available ground was such that it was cheaper to build the standpipe than to erect a tank of smaller capacity on a short tower. In order to make use of the full amount of storage, a booster pump was installed in the valve house adjacent to the standpipe to discharge into the distribution system. This pump, of 5 mgd capacity, is normally driven by electric motor controlled from the pumping station by Polaricode, Jr., supervisory equipment. If for any reason current is not available, a man will be sent to the standpipe and can operate the pump by gasoline engine. An over-running clutch type of coupling is used on each end of the pump shaft requiring no manual work when changing from one type of drive to the other. By means of the supervisory equipment the station operator can also open and close the pump discharge valve, the cone-type altitude valve, communicate with the standpipe pump house by telephone and also have a continuous record of water elevation in the tank. This is done over one pair of telephone wires rented from the telephone company.

7. Since construction of the filtration plant, the wash water has been discharged into the lake at the foot of the public bathing beach. This produced objectionable conditions as well as constituting a hazard on account of the velocity of the flow from the pipe. The State Board of Health had recommended that steps be taken to eliminate this discharge and to treat the wash water to remove the solid matter. It was suggested that laboratory work be done on the material and that a plant for treatment be designed on the basis of the experimental work. A considerable amount of research indicated that much more study was required to properly design a plant, so connections were made to an abandoned line of 24-inch cast iron pipe to use it as a discharge to the river about 1,400 feet away. In addition an experimental plant was built to be used for large-scale experiments on which to base the final plant design. This work consisted of a steel storage tank to supply three 25 gpm pumps discharging to three types of treatment units.

8. All electric-driven centrifugal pumps at the station are provided with automatic cone valves on their discharge. These pumps are connected to a common header which is looped and connected to the transmission main to the city. This main is so laid out as to constitute a loop a quarter mile across. As the high-lift pump discharge lines crossed through the low-lift pump room, there was some possibility that a rupture of them or of a pump connection might flood the station and put it out of service. Therefore two pitot tube controlled automatic cone valves were installed in chambers in the street. These were 24-inch valves set between long-pattern reducers and are so designed that they will close upon reversal of flow.

The settling basin additions and the service building plans and specifications were prepared by Alvord.

Burdick & Howson, consulting engineers, with whom our engineers worked closely, especially on details desired in the service building. The other items of the project were designed and all construction supervised by our own department, Frank K. Quimby, construction engineer, E. Miles Griffith, assistant engineer.

The manufacturers of principal equipment installed in the work described were as follows:

Flocculators, The Dorr Co.; service building cranes, David Round & Son; service building monorails, American Monorail Co.; booster pump, Dayton-Dowd Co.; Polaricode, Jr. controls, Westinghouse Mfg. Co.; cone valves, Anderson Valve Corp.; C. I. pipe and fittings, U. S. Pipe & Foundry Co.; gate valves, Ludlow Valve Mfg. Co. and Darling Valve & Mfg. Co.

Rapid Sewerage at San Diego, California

By B. D. PHELPS
Assistant City Engineer

SAN DIEGO, a residential city and base for the U. S. destroyer fleet, had a population of 148,000 in 1930 and 203,000 by the 1940 census. Then the Consolidated Aircraft Corporation obtained contracts for $750,000,000 and by April 1941 the population had increased by 30,000, and in August 1941 it was estimated to be close to 300,000, with more coming. A housing shortage has resulted. The U. S. Navy has constructed two housing projects of 600 units to take care of their own personnel, and the Federal Government has almost completed a 3,000-unit project. Several government trailer camps with trailers have been made available for renting.

This condition brought to a head the need of adequate sewerage. For over 20 years the State Board of Health and the City Engineer's office had advocated trunk sewers and an interceptor around San Diego Bay and a treatment plant to eliminate pollution of the bay; but nothing was done until 1940, when WPA funds, available for Emergency National Defense Projects, were obtained for building a new outfall sewer at the destroyer base at a cost of $108,500, a treatment plant to cost $456,766, and a trunk sewer around San Diego bay to cost $1,505,700.

The outfall sewer includes 2,400 lineal feet of pipe, 1,200 ft. of it 35 ft. below water surface. The trunk sewer consists of 12 miles of 60″ to 12″ pipe. Plenty of WPA men are available, most of them elderly but experienced in the work required. Machinery is used for trenching, lowering pipe and backfilling. To facilitate rapid completion the Navy has authorized letting contracts for trench excavation for about 8 miles of sewer, the WPA to lay the pipe and complete the work. A large pump house will be completed by private funds to relieve the overcrowded sewers near the new Consolidated plant.

In the early spring of 1941 it was found that all the sewers were greatly overloaded and a comprehensive plan for trunk sewers was prepared; and in April the voters approved, by a better than 5 to 1 vote, the issuing of $1,980,000 in bonds to finance this work, which consisted of 56 miles of 6″ to 39″ pipe.

Meantime, one housing unit has built 27 miles of sewers with a treatment plant, and another housing project is now starting for which 10 miles of sewers will be constructed.

Rapid Airport Construction by WPA

(Continued from page 19)

ect required operation on a highly mechanized basis. Part of the large amount of equipment assembled was owned by the WPA and part of the U. S. Army Engineers, and a large part of it was rented. This equipment included the following: a pug mill concrete mixer; a 60-ton batching bin and two drag lines with 1½-yard clamshells; 5 pavers; 14 tractors, ranging from 45 H.P. to 90 H.P.; 34 dump trucks, ranging from 3-yard to 5-yard capacity; 52 flat bed trucks; 18 1½-ton tank trucks; three sheepsfoot rollers; two 8-ton rollers; two 10-ton rollers; eight motor graders; and two road rippers.

A total of 1,500 men was employed by the WPA on this project, and in spite of the speed with which the project was operated and the large amount of heavy and motorized equipment used, there were no serious accidents and very few lost-time injuries suffered by the workmen.

In addition to the WPA projects, the War Department has completed by contract, a large cantonment at the field for the housing of a personnel of 3,118 men.

Power From Incinerator Used By Providence Sewage Plant

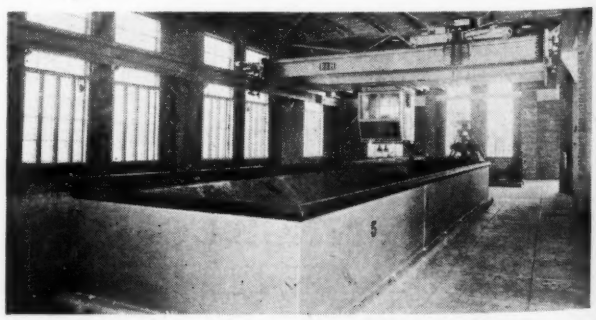
(Continued from page 29)

dropped onto the grate through a sliding door powered by a pneumatic cylinder operated from the stoking floor.

The dumping grates dump half the fire bed of each cell at a time, dropping the ash and clinkers into the ash hopper. From the hopper the ashes are discharged into a water-filled ash trough in which the hopper nozzles are immersed, the water providing a seal against air leakage, quenching hot cinders and eliminating dust. A flight conveyor removes the ash from the trough into an ash storage bin. The ash handling system is entirely automatic, requiring only the part-time service of one man.

Air for combustion is furnished by Sturtevant silent vane type fans with a maximum capacity of 15,800 cfm at 5.3″ s.p, directly connected to Terry turbines, furnished in duplicate. They are located on the furnace operating floor, draw air from the room and discharge it through a preheater which delivers it to the cells at approximately 350° F.

The refuse burned is approximately 65% garbage and 35% rubbish, the former including the paper in which the garbage is required to be wrapped, and



Charging Hopper Floor

contains about 55% moisture. The heat value is conservatively averaged at 3600 B.t.u. (3300 was assumed for design purposes). Gas from the incinerator passes through a 1450 cu. ft. combustion chamber, where the temperature varies from 1800° to 2500° F, from which it passes to the entrance flues of two boilers, each of which contains a damper operated from the boiler operating floor.

There are two Sterling 4-drum boilers, furnished by the Babcock & Wilcox Co., each designed to produce 23,700 lb. of steam per hour when supplied with 82,000 lb. of gases at 1730° temperature, with 105° superheat. Each boiler is equipped with a 500 gph Tyrrell oil burner, for use in case the incinerator is out of service for repairs; and a 16,000 gal. fuel oil tank is provided. There is an Elliott 36,000 lb. per hr. deaerating feed-water heater, and duplicate feed-water pumps.

The steam produced operates turbine generator units furnished by the Westinghouse Electric & Mfg. Co., each unit consisting of a 1250 kw generator, 2300 volts, 3 phase 60 cycles, operating at 3600 rpm, driven by a condensing type steam turbine. Westinghouse also furnished the switchboard, which contains 7 metal cubicles for controlling the 2300 volt circuits, and 4 additional panels for controlling the 550 and 110 volt station circuits.

The contract for incinerator and boiler guaranteed production of 16,230 lb. of steam per hour when burning refuse at the rate of 150 tons daily, and 20,000 lb. when burning 160 tons daily—equivalent to actual evaporation of 1.5 lb. per pound of refuse. With the exception of the first week of operation this guarantee has been exceeded, reaching a maximum of 2.10 lb. in November when incinerating at the rate of 112.7 tons daily. Operating and firing methods have improved steadily and the plant is evaporating an average of 2 lb. of steam per pound of refuse.

The company guaranteed that the electrical production of the plant, exclusive of station requirements, would be not less than 950 kwh when burning 130 tons daily and 1240 kwh at 160 tons daily. This was based on furnishing power for sewage pumping as well as for the blowers. As the pumps have not yet been operated by this power it has been difficult to check on the power guarantees. Recently a short-term test was made by creating a load of 1050 kw on the three blowers when consuming refuse at the rate of 101.5 tons per day, when the power production exceeded the guarantee by 33⅓%. The blowers, furnished by the Roots-Connersville Blower Corp., exceeded the guaranteed air output by about 5% and were 10% under the guaranteed power required.

Thin Concrete Dome Roofs for Reservoirs

Two 1.5 million-gallon reservoirs have been built by the Ecusta Paper Co. at Pisgah Forest, N. C., which have unusually thin roofts—4″ at the lower edges and 2″ at the center. The tank diameter is 155 ft. and the rise of the domed roofs one-eighth of this. The concrete was applied pneumatically. The roofs are supported by walls 11 ft. high, 9″ thick at the bottom and 4″ at the top, with pre-stressed reinforcing bands. After the inner or main wall had been built it was surrounded by bands drawn by turnbuckes to a predetermined stress; then the outside was covered with cement mortar applied pneumatically.

Water Supply and Sewerage at Army Camps

(Continued from page 24)

increase to 80 gallons per capita per day with a maximum sewage flow of 150 gallons during the periods of peak usage.

Table II—Per Capita Flow Rates at Army Post No. 2

(Gallons Per Capita Per Day)

Population	*Water Usage*	*Sewage Flow Avg.*	*Max.*
Mixed Military—Civilian	80	34	42
Military	..	42	73
Civilian (Day Duty)	..	16	29
Barracks	..	70	..

For the purposes of the test it was fortunate to have a rather large group of employees working by the day at both Post No. 2 and Post No. 3. It has been found that on week days an average daily flow of about 34 gallons per capita for all persons on the Post could be expected, and that under these conditions the average flow, during the period from 10:00 A.M. to 11:00 A.M., was 77 gallons per minute, with a maximum of 120 gallons per minute. The peaks consistently occur in the period from 10:00 A.M. to 11:00 A.M. and the minimum flow consistently occurs in the early morning hours around 5:00 A.M. It is also interesting to note a prevailing four-peak flow at these posts rather than the usual three peaks encountered in municipal sewage flows.

The sewage treatment plant at Post No. 2 receives not only the wastes from its own personnel, but also those from about 2,000 day laborers and part of the flow from an adjoining post. By contrasting the flows during the week days, when the civilian population was on the post, with the flows of the Saturday afternoon and Sundays when only military population was present, it has been possible to derive figures to show what increase can be expected from the civilian population working on the post for eight hours per day. In place of the expected high water usage occasioned by these men, we find that the per capita flow contributed by the 2,000 workers averages 16 gallons per man per day, and the maximum daily per capita flow at any particular time during the work week is 29 gallons. We feel that it would be safe to design for the civilian day population on the basis of an average flow of 20 gallons per man per day with an allowance of 100% increase for the peak flow at any particular time.

Strength of sewage at Army posts: The strength of sewage at Army posts and institutions has been a point of question and contention. In the following table are given averaged results of several separate analyses of sewage from two posts studied:

Table III—Analysis of Sewage at Army Posts

(Averages Based on Several Analyses)

Post	*B.O.D.*	*Oxygen Consumed*	*Chlorides*	*Alkalinity*	*Suspended Solids*
Post No. 1					
(Raw)	212	155	44	357	178
(Treated)	116	40	40	352	86
Post No. 2					
(Raw)	200	50	33	320	..
(Treated)	85	46	35	300	63

These figures indicate that the strength of the raw sewage from such posts corresponds very closely to that from any normal domestic group of units and is

neither weaker nor stronger than that of average Texas cities; and other similar data collected by the authors tend to bear out this finding. Therefore, in the design of treatment plant capacity no allowance should be made for handling a sewage weaker than that treated in municipal plants.

The above is slightly condensed from a paper before the 1941 Texas Water Works and Sewerage Short School.

Sewer Not Laid According to Plan

In 1938 the Second Circuit Court of Appeals (Sound Marine & Machine Corp. v. Westchester County, 100 F. 2d 360, certiorari denied, 306 U. S. 642) sustained the admiralty jurisdiction of the Federal District Court for Southern New York of a libel seeking damages resulting from the laying of a sewer pipe that impaired access by water to the libelant's land. The court then remanded the cause for determination of the question whether the sewer pipe was laid in accordance with the permit issued by the War Department. That permit, dated October 2, 1929, authorized Westchester County, N. Y., "to lay a sewer pipe in a branch . . . in accordance with the plans shown on the drawings attached hereto." On this mandate a hearing was held and on the evidence the District Court found as a fact that the sewer pipe was not laid in accordance with the permit and granted the libelant an interlocutory decree. Westchester County appealed.

The Circuit Court of Appeals (113 F. 2d 931) said that, adhering, as it did, to its prior decision as to the law, the sole question was whether the District Judge's finding of fact was sustainable, and held the evidence supported it. "Much of the sewer," the court said, "was laid on piles capped by timbers upon which the pipe rested. Evidence is lacking of any excavation before the piles were driven. There was a failure of proof that the sewer was laid 'in a trench' as the permit required." The District Court's decree was therefore affirmed.

City Not Insurer of Water or Sewer System Against Leakage

In an action against a city for flooding a basement by a leak from a water main, the Georgia Court of Appeals (City of Tallapoosa v. Goebel, 10 S. E. 2d 201) stated the law in such cases thus: "In all sewer or water main cases cited by the plaintiff in which the city has been held liable there was either evidence of actual negligence in the construction or operation of the water main or sewer, or notice to the city authorities of the break or flow, accompanied by neglect on their part to repair promptly, or actual notice by reason of like occurrences that the sewer or main was defectively constructed or maintained. . . . A municipality is not an insurer of its water or sewer system any more than of its streets. It is required only to use reasonable care in establishing and maintaining such a system." However, if the city failed after notice of the leak to use ordinary care to turn off the water and avert the danger of damages in which the other's negligence (failure to repair the lateral pipe) had placed the plaintiff's property, the plaintiff may nevertheless recover.

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Traffic was maintained during construction

Moving A Water Main In Conneaut Without Discontinuing Service

(Continued from page 30)

tests to be assured that the earth was back in as good condition as before it was removed. There were only three complete shut-downs during the entire construction and they were only for two hours duration.

All parties worked harmoniously and the general plan worked well, but some difficulties were encountered. One very exciting incident occurred when the sewer trencher and the gas and electricity men were all working at one corner. The trencher cut off a live 1" water pipe and a gas pipe of the same size, with the result that water filled the trench and backed up into the gas line, and water instead of gas gushed forth when people in this vicinity tried to use their gas stoves, and it was late into the night before the gas service was resumed.

After preparing plans and specifications for this job it was found that the Water Department was unable to finance the project at this time owing to the $400,000.00 Water Works bonds becoming due on June 1, 1941. It was, therefore, referred to the W.P.A. and the project was set up on a percentage basis, the W.P.A. furnishing a certain percent, and the Water Department the balance, including the pipe layers and calkers.

We were notified in July that the contract for paving and drain had been let to the Patterson Construction Co. of Wellsville, O., and there was a scramble between the utilities to see which one would get the lead. We arrived at the same time and worked harmoniously together and all was completed on September 30, although an official count showed that 347 cars passed during one hour while we were at work and this was a fair sample of the three months that we were engaged in the work.

The old main, which had been installed by the writer, was cast iron B&S sand cast and was in excellent condition as it had only been in service for thirty years. Some of this reclaimed pipe was recoated with asphaltum paint and put back into service on the same job.

Widening and Surfacing, Using Tar and Asphalt Emulsion

(Continued from page 27)

over this was placed the loose stone mentioned above. Where there was not enough of this stone to cover the oil, sufficient No. 46 stone was scattered over the surface. Where there was an excess of stone, allowance was made when placing stone for the next course.

It requires ten days or more for the oil to become tacky enough to stay when rolled. Rolling should be done at the right time, preferably when the bitumen will stick together like a popcorn ball, to use a homely illustration. Just when the next course is placed is not important, as traffic can be allowed on the road at once, and quite a time may elapse before the work is completed. In 1938, we treated two miles in November and found it in good shape the next summer, having done some maintaining as for as any bituminous top. We usually allowed at least a couple of weeks to elapse so that if any defects in the new work should develop, it could be repaired before the top was placed; but this does not happen often.

For the second course we spread 70 lbs. per sq. yd. of No. 46 stone, taking into account any excess that might have been placed on the first course; this usually is a small factor, and if the spreader man uses his head, it will not make any material difference in the final result. We found that the men were soon able to so control the spreader that the result was quite uniform.

Using either asphalt emulsion (AE3 Ohio or Indiana specifications), or tar (RT5) we placed 0.7 gallon per sq. yd. on one-half of the road (usually the right side), following the distributor with the power graders; the first grader windrowing the mixture to the outside; the second placing the windrow to the center, or as nearly so as possible, without getting over the center; while the third grader carried this back to just outside the quarter. This was so regulated that the fourth grader, which was equipped with a shield (or edger) on the right end of the blade to regulate the width of the material, could carry a full blade and distribute the material uniformly over the half-width of the road. Care was used to get the outside straight and not to either overrun or skimp the center. Then the other half of the road was placed.

Needless to say, to accomplish all this requires team work on the part of every one; in this we were very fortunate.

Following the spreader, as soon as the material had set sufficiently, came the ten-ton roller, which was equipped with a water tank so that the rolls could be kept wet at all times to prevent sticking. We used plenty of water and commenced rolling as soon as possible after the entire surface width was placed. We usually worked in one-mile or half-mile sections; when possible, we used the patch roller behind the ten-ton, since by filling the former we could get as much pressure on the 42-inch face as with the heavier roller with its 7-ft. base. Care must be used to roll in the proper crown; the writer prefers about three inches, but this must be regulated by weather conditions and drainage.

No definite rule as to the amount of rolling necessary can be given; we probably fail in rolling too little rather than too much. The rolling finished, a

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seal course of 0.3 gallon of the same material as was used in the previous course was then applied and immediately followed by the spreader, using No. 9 stone (about the size of shelled pop corn) placing about 15 lbs. per sq. yd., or just enough to cover the bitumen and not have an excess which would wash off and be lost; however, some of this cannot be helped.

To prevent picking up, the trucks had to back up, running the spreader ahead in reverse. This, too, requires practice and teamwork; the head spreaderman here, as on the other course, must be able to do and say the right thing at the right time. When this course is well rolled the road is ready for traffic.

The stone sizes mentioned conform to the Ohio state specifications: No. 2 stone, ranges between 1½" and 3"; No. 46 stone, ranges between ⅜" and 1"; No. 7 stone, ranges between ¼" to dust; No. 9 stone is in reality No. 7 stone with the sand removed. At times No. 6 stone is used instead of No. 9, but the writer prefers No. 9, as it gives a smooth, noiseless road, while on the No. 6 top coat there is a certain accompanying noise as autos travel at a fair rate of speed.

Federal Funds for Civil Airports

Congress has appropriated $94,977,500 for civil airport construction, and allocation of most of this for 318 projects was announced Aug. 1 by the Civil Aeronautics Administration. Of these, 216 will be constructed by contract, 87 by WPA and 15 by a combination of the two. The funds allocated range from $16,000 for Savannah, Ga., to $2,600,000 for Pittsburgh, Pa.

Dewatering Trench as Part of a Sewer Contract

A contract for the construction of a trunk sewer required the contractor to dewater the trench. The contractor anticipated the trench could be kept dry by the use of well-points. The presence of clay rendered the well-point system unsatisfactory and other methods of drainage were considered. A subdrain method was tried which proved satisfactory, and the city engineer prepared plans for such a drain. The contractor agreed to place the drain for $2 per linear foot. The city engineer was succeeded by another, who wrote the contractor he would be paid for work already done under this agreement (which was afterwards done) but no further payment for subdrains or other means of dewatering the trench would be allowed under the contract. The contractor replied that it was entitled to receive payment for any subdrain it should construct during the balance of the work. The contract was thereafter fully performed and the contractor sued for work on the subdrain, basing its case on the ground that the city was bound by the first city engineer's agreement to pay $2 per linear foot. The city contended that by the contract the contractor was required to install drainage necessary to keep the trench dry, and that the engineer's agreement to pay was a mere gratuity which the city had no right to make. The Washington Supreme Court (Queen City Const. Co. v. City of Seattle, 99 P. 2d 407) sustained the city's contention and reversed judgment for plaintiff. The soil and water conditions found in the course of the work were held within the reasonable contemplation of all parties concerned.

Operating Percolating Filters In Series

(Continued from page 22)

scribed in detail. Associated with this film was a rich fauna including protoza, Oligochaetae, insects in every stage of development, mites and spiders.

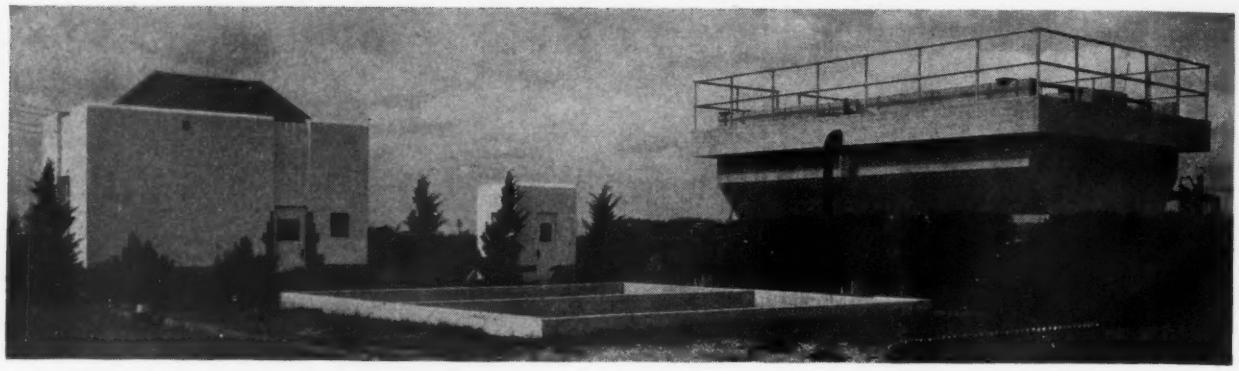
Just before each change made in the order of the filters, there was usually a considerable amount of film on the surface of the primary filter but very little other than algae on the secondary; but a day or two after the change there was a rapid alteration, the growth on the secondary filter disappearing and that on the primary increasing.

During the cold winter months, the net increase in the quantity of biological film in the surface layer of the medium was less in the filters used for alternating double filtration than in the filter used for single filtration. With the system of double filtration, much of the film in the surface layer was decomposed or disintegrated and removed from each filter during alternate weeks when the filter occupied the secondary position and received effluent from the other filter. As a result, ponding was more extensive and continued over a longer period during the winter on the surface of the single filter than on the two filters used for double filtration, though the rate of treatment of sewage by alternating double filtration was much greater than by single filtration.

Commenting on these papers, "The Surveyor" says editorially: "It was surprising to hear some speakers at the meeting subscribing wholeheartedly to the view that the new process had definitely proved itself twice as efficient as the old one. Under the conditions of the experiment, this was so, but pending the publication of further results, it would not be wise to generalise on these lines. For example, it should be noted that the process has not been called upon to deal with wet-weather variations in flow. It has operated on a steady flow, both throughout the day and night, and also from day to day. These conditions are rarely, if ever, obtainable on a sewage works. Until the process has proved its adaptability to heavy increases in flow and to wide variations as between day and night flows, such sweeping deductions are not justified.

"There are also one or two points in the papers themselves which give rise to some misgivings. For example, although the series filters showed (on the average) less surface growth than did the ordinary single-stage filter, there was a tendency to develop fungal growth deeper down the bed, tough mats of *Sepedonium* being found in some places at a depth of 14 in. Chokage in the body of a filter is not as easy to detect as at the surface, and it is more difficult to deal with by manual means.

"The practice of exchanging the order of the filters appears to be beneficial for removing growths, but it is doubtful whether it is an ideal arrangement from the point of view of purification. For the latter purpose, it would almost certainly be advantageous to keep filters on the same type of duty all the time, thus permitting the development of organisms best fitted for each stage of the purification process."



Pump house and laboratory of the Rayne, La., sewage treatment plant. Imhoff tank at right.

The Sewerage Digest

HOW TO FIND ORIGINAL ARTICLES. Key letter at end of each digest refers to name of publication listed in bibliography at end of this section. Numeral indicates title of article.

Periodic Treatment For Louisville, Ky.

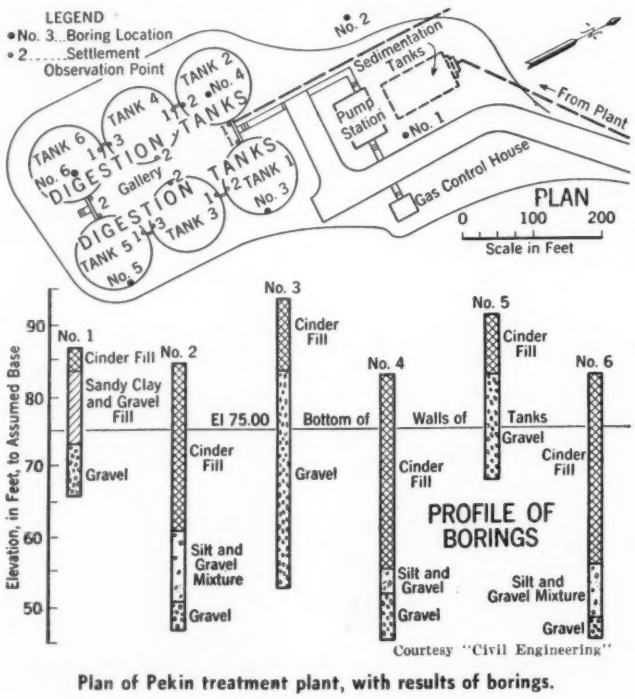
Louisville discharges 54 mgd of sewage into the Ohio River through numerous outlets. The flow of the river here ranges from 718,000 mgd to 1,360 mgd. The effect of the city's sewage is marked down to West Point, Ky.; substantial oxygen resources remain, but in September coli-aerogenes indices as high as 1,000,000 per 100 c.c. were found. A dam at the city forms a pool in the river and with low flow and upstream winds sewage may be carried upstream to the intake of the city's water supply, and it is therefore recommended that an interceptor be built along the river carrying all sewage below the dam, and also below the water intake for New Albany, a city across the river and just below the dam. The interceptor would end in a treatment plant designed to remove floating solids and grease and sufficient suspended matter to prevent sludge deposits in the river; the plant to comprise screens, grit chambers, sedimentation tanks, digestion tanks, filters and incinerator. The plant will have a capacity to treat 268 mgd, or 3.6 times the average flow. During six months of the year the river flow will be so great that it will not be necessary to divert the sewage from the existing outlets or to treat it. The treatment plant is estimated to cost $1,600,000, and the interceptor and pumping stations $4,400,000.[H39]

Results at Gary Activated Sludge Plant

The activated sludge plant at Gary, Ind., was designed to dispose of both sewage and ground garbage, but no garbage has yet been handled by it. In April, 1941, the average flow was 18.25 mgd, the average air consumption was 0.51 cu. ft. per gal.; B.O.D. of crude sewage 174 ppm. of the effluent 6.1 ppm (a max. of 9 ppm one day only). Gas produced by digesion, 1.57 cu. ft. per capita, furnished all the power to operate the blowers and do all the pumping. Total operating and maintenance cost, $10.21 per million gal., 5.6 c. per capita per month, $7.22 per 1,000 lb. of B.O.D. removed. There are two 300 hp. gas engines direct connected to 7,000 c.f.a. rotary blowers, and three 175 hp. engines driving 20 mgd pumps.[G24]

Difficult Foundations For a Treatment Plant

A plant at Pekin, Ill., for treating industrial wastes comprised two settling tanks, pump station, and six digestion tanks, 50 ft. diameter with 22 ft. side walls and 8 ft. conical bottom, on opposite sides of a gallery. The site of the plant was all filled with cinders containing quantities of lumber, etc., underlain with gravel or gravel mixed with silt. The bottom of the tank walls was in gravel for tanks Nos. 1, 3 and 5 and in cinders for Nos. 2, 4 and 6. When they had been completed they were filled with water, and the tanks on gravel settled 0.05 to 0.08 ft., while those on cinders settled 0.54 to 0.70 ft., were then 2" out of plumb and several inches from their original location. After this the gallery floor was laid, a reinforced concrete mat with half as great a unit foundation load as the tanks, separated from the tanks by a clear 2" to insure freedom of interference with future settling. For the same purpose, inlet and overflow piping was hung from the gallery roof by adjustable hangers, and the sludge pipe was supported on adjustable pipe stands on the floor; pipe connections to the tanks were hung from the tank walls; and the two systems were connected using couplings that permit movement 1½" either way without leaking.[L3]

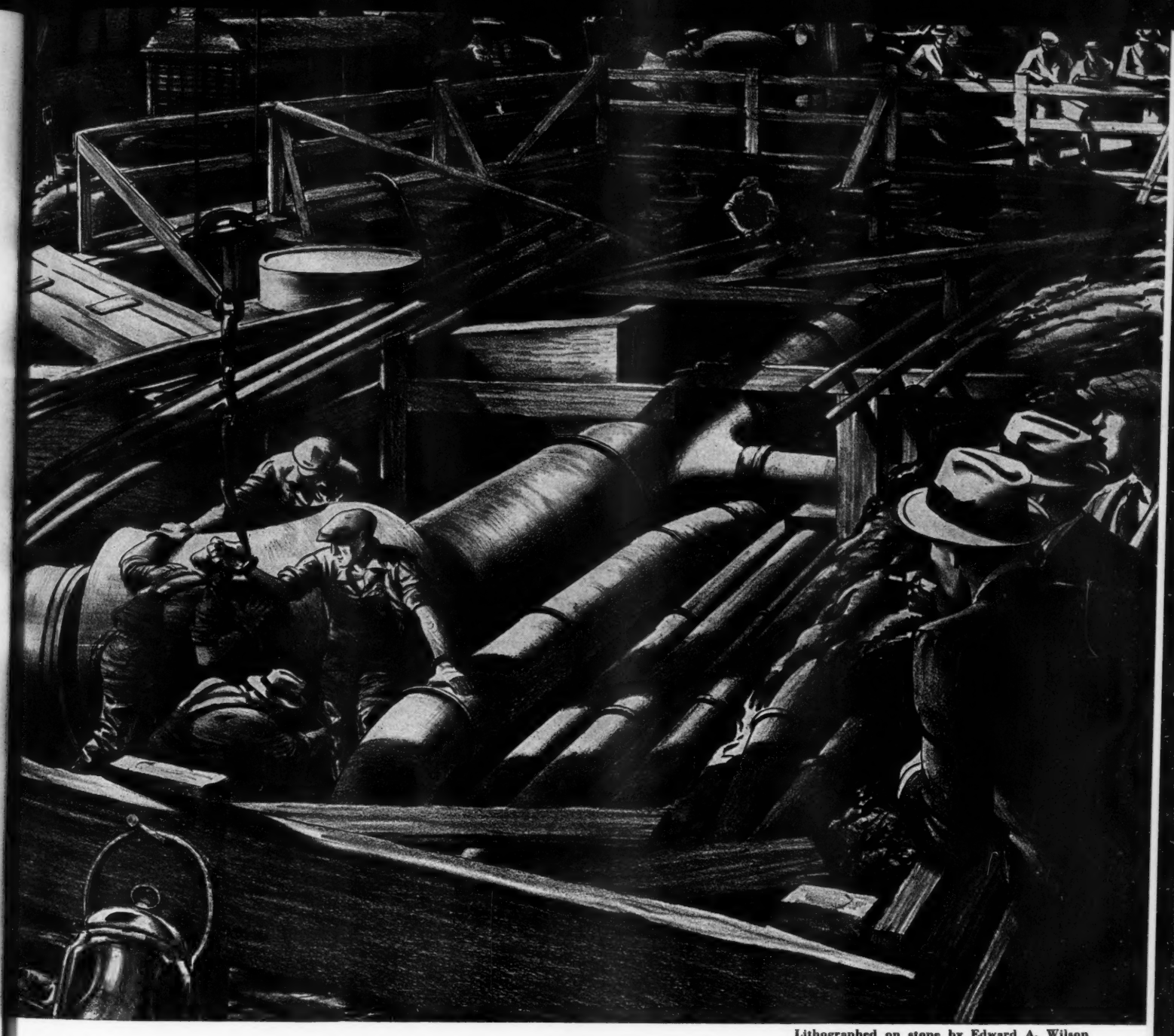


Courtesy "Civil Engineering"

Plan of Pekin treatment plant, with results of borings.

Multiple-Tray Clarification at Springfield

Springfield, Mo., in 1940 built a trickling filter plant one feature of which was the first multiple-tray clarifiers to be installed in a large sewage works. The plant had formerly contained two 50 ft. square sedimentation tanks. In each of these was placed a circular steel plate tank in which three trays or floors of concrete were supported by trusses and girders. Radial arms on each tray sweep the sludge to slots through which it falls to the bottom, where a double spiral moves it to a central sump. A skimmer on the top tray removes scum. Each tank has a total settling area of 7,600 sq. ft.—1,722 for each tray and



Lithographed on stone by Edward A. Wilson

The arteries of a community are its underground conduits — pipe lines transporting water, gas, sewage, power. Of primary importance are water mains for without water humanity could not exist for a week. It is significant that more than 98 per cent of the water distribution mains of America's 15 largest cities are cast iron mains. It means that, for generations, the best engineering minds have continued to specify cast iron pipe for underground mains.

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2,500 sq. ft. of bottom floor, giving 725 gpd per sq. ft. with a detention time of 33 min. A test showed 61% reduction of suspended solids through these units. During the period June 1 to Dec. 15, the plant gave a reduction of 93.1% of suspended solids and 93.9% of B.O.D.[H41]

Trickling Filter and Activated Sludge Bacteria

The predominant zoogleal bacteria of trickling filters and of activated sludges may be used interchangeably without impairment of purification efficiency. The members of this group of bacteria are the active agents in purification by biological processes and probably the maintenance of conditions favoring this growth would expedite such purification procedures. The predominant bacteria of activated sludge in pure culture have the same ability to produce adherent growths on filter stones as have trickling filter bacteria; and trickling filter bacteria placed in a liquid medium can grow in a massed floc or colony which binds itself together tenaciously.[C48]

Inert Materials in Sewage Coagulation

Laboratory experiments with wastes from industrial processes (tan bark, flue dust, iron oxide and sludge ash) and inert commercial products (activated carbon, bleaching clay, diatomaceous earth and bentonite) show that inert materials are in general of little value in aiding chemical treatment of sewage; they can accelerate the compacting of chemical sludge but the quantity necessary is unduly great. Of all the materials tried, digested sludge ash gave the best over-all results.[C51]

Determination of Grease in Sewage

When an acidified sewage sample is evaporated to dryness in a test for grease content, the fatty acids may revert to calcium and magnesium soaps, which are only slightly soluble in chloroform or similar extracting agents. A boiling-freezing procedure is suggested; the boiling to insure complete reversion of soaps to fatty acids and concentrate the grease on the surface, followed by low temperature to change the grease to a solid or very viscous form which can be removed by filtration. It is believed the residue so obtained will contain practically all the grease materials of sanitary significance.[C52]

Trends in Sewage Treatment

Screenings will be ground and returned to the raw sewage in most new plants. Grit removal and washing is advisable for plants of all sizes. Preaeration for grease removal is now restricted to sewage containing considerable quantities of industrial waste. Grease skimming will probably be confined to large plants, chiefly of the activated sludge type. Two-stage primary settling is only slightly better than one-stage, but a more readily settleable activated sludge has been obtained by returning only the coarser sludge that settled in the first tank. Flocculation to improve the efficiency of raw sewage and trickling filter effluent settling will be used extensively. The boom days of chemical precipitation are over, but it is useful for a number of purposes such as part-time treatment, for industrial wastes and odor control. It cannot compete with biological processes in producing a low BOD, but produces clear, sparkling effluents low in suspended solids. In general, large activated sludge plants use diffused air, small ones use mechanical aerating devices, some of which have offered impossible guarantees regarding power reqirements and effluent standards. High-rate filters will probably replace activated sludge for all except large plants. There is limited use of the "washable filter," which is backwashed with air and effluent. To date no synthetic material has been produced that can compete economically with crushed rock as a filter medium. Effluent filters will probably continue in use. Downflow circular magnetite filters are more satisfactory than rectangular or upflow circular ones. Data show that stirring of digesters increases gas production and reduces scum. The vacuum filter is the

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preferred device for dewatering sludge; but for small or medium sized plants the use of anything but sand drying beds for dewatering digested sludge is questionable. Elutriation is justified for digested mixed sludges which otherwise require very heavy doses of conditioner. Heat-conditioning raw sludge ahead of filtration is used in England but probably will not be used here. No centrifuges tried to date are as satisfactory as thickeners for concentrating waste activated sludge. Interest in sludge drying is mounting at the expense of incineration because of the use of dried sludge as fertilizer or fertilizer base; incinerators should be designed with provision for operating as a dryer when desired. All incinerators are costly and require close supervision and should not be used in small or medium sized plants if other means of disposal are available.[C53]

Engines Using Sludge Gas

More than 180 sludge gas engines are in use in over 115 plants. Of 180 listed, 79 are connected to generators, 49 to blowers, and 40 to pumps. They vary in size from 2 kw to 1,440 hp; the majority are under 500 hp. With few exceptions they are vertical multi-cylinder units operating on the 4-stroke cycle, at speeds ranging from 225 rpm for the large engines to 900 rpm for the small.[H32]

Lubrication is important. Deposits and wear can be minimized, and the resulting forced shut-downs for repairs, frequent overhauls for cleaning, loss of efficiency and engine capacity can be avoided, only by the use of high-quality lubricants, specially refined for use in internal combustion engines.[H31]

Engines now in service develop about 35,000 hp, of which about 5,000 is developed by 11 units in New York City. That city also has 4,300 hp installed but not yet operating, 4320 hp under construction and 3,900 under design; all plants designed since 1935 include such engines. They are used mainly to supply power and light requirements of the plants, the waste heat of cooling water and exhaust gases being used for heating digesters and buildings. About 26% of the energy in the gas is recovered in work, 36% from jacket water and 18% from exhaust gases. The calorific value of gas averages 650 Btu as against 537 Btu required for utility gas. At the Coney Island plant sulphur ranges from 0.37 to 2.50 grains per 100 cu. ft., while 30 grains is permitted in utility gas. The engines have operated 5½ years without any power failure. Repairs (three 300 hp engines) have cost $7,115—chiefly in connection with the ignition system.[H34]

At Birmingham, Mich., a 32.5 hp gas engine operates the sewage pump and saves $2.00 a day cost of current; cost of repairs, $200 in 18 months. Gas production ranges from 16 to 2 cfm and a gas holder is desirable to maintain both volume and pressure.[H35]

At Battle Creek, Mich., a 55 hp gas engine cost, during 4½ years of operation, $582 for repairs and $641 for lubricants; equals 53c per mg of sewage pumped, compared to $1.25 by purchased power; engine almost pays for itself each year.[H37]

Temperature of River Muds

Variations in temperature throughout the year determine the rate of activity of the biological agents of natural purification of river muds and pollutional sediments. Bottom temperature lags slightly behind that of the water above; in deep lakes it may stay nearly constant. Although the strictly aerobic stabilization of pollutional deposits is fundamentally more rapid, the anaerobic phase of benthal decomposition may actually complete its course in advance of the aerobic phase because the opportunity for aerobic stabilization is a function of the rate of vertical transport of oxidizable substance to the zone of oxidation in close proximity to the sludge-water interface.[C58]

Scum on Digestion Tanks

Scum forms on some tanks 10-12 ft. thick and so dense as to break scum mixers. Hair from tanneries, packing house wastes, trickling filter snail shells, leaves, seeds, hair, tin foil are the mate-

rials most generally found. In most plants the scum is thickest in cold weather. At two plants, the gas, prevented from escaping by the scum, lifted the roof from the side walls. Most plants have more or less success in breaking up and softening the scum by use of water sprays. Also, most remove it at intervals by hand, Kitchener when an overload mechanism on the stirring mechanism approaches critical values. Several recommend fine screens above the sedimentation tanks. Remedies found more or less effective were: at Sioux Falls, daily recirculation for 2 hrs. At Mansfield, O., turbo-mixers are operated continuously. Some plants control the scum by heating the digester to 95° to 100° for 48 hrs. At several plants scum was greatly reduced by chlorination. In Imhoff tanks at Urbana, Champaign, Decatur and other places, spraying once or twice a day facilitates escape of gas, keeps the thickness of scum under control and washes out organic acids, thus preventing foaming.[C60]

Emergency Treatment At Camp Croft

Camp Croft, S. C., pumps its sewage to the treatment plant of Spartanburg, S. C.; but several weeks before the pumping plant could be finished 10,000 soldiers were to reach camp. To provide temporarily for the sewage, assumed at 70 gal. per capita, a basin was dug 100 x 30 x 5 ft. deep, giving 2 hr. detention, and a dosing basin giving 20 min. detention. The sewage was dosed with 8 ppm calcium hypochlorite, fed from wooden barrels through a wooden spigot and rubber hose. B.O.D. was reduced from 215 ppm to 115 and suspended solids from 472 to 165 ppm. There were no offensive odors. When the pumps were ready to handle the sewage the basins were drained and dosed with 1,000 lb. of lime and backfilled.[E13]

Bibliography of Sewerage Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

D *The Surveyor*

June 27

16. *p.* Purification of Strong Sewage by Recirculation Through a Percolating Filter. By W. Watson. Pp. 395-396.

July 4

17. *p.* Purification of Strong Sewage by Recirculation Through a Percolating Filter. By W. Watson. Pp. 5-6.

July 11

18. Repair of War Damage to Sewers. Pp. 17-18.

July 25

19. Purification of Strong Sewage by Recirculation. Discussion of D 16 and 17. P. 33.

E *Engineering News-Record*

July 31

13. Emergency Sewage Treatment. By E. A. Smith. Pp. 64-65.

August 14

14. *c.* Chemical Joint Sealing and Soil Solidification.

G *Water Works & Sewerage*

July

24. Gary Treatment Works Giving Good Account of Itself. P. 332.

H *Sewage Works Engineering*

August

39. Louisville to Treat Sewage Six Months Each Year. By W. M. Caye and H. P. Eddy, Jr. Pp. 416-419.
40. Improving Plant Operation With Chlorine. By W. E. Stanley. Pp. 420-421.
41. Multiple Tray Clarification at Springfield, Mo. By J. K. Frei. Pp. 423-425.
42. Do Gas Engines Pay?—A Symposium. Pp. 426-429, 434.

J *American City*

August

18. Primary Sewage Treatment at Wisconsin Rapids, Wis. By J. W. Townsend. Pp. 65, 67, 69, 73.

L *Civil Engineering*

August

3. *c.* Constructing a Treatment Plant for Industrial Waste. By J. W. Greenleaf, Jr. Pp. 483-486.

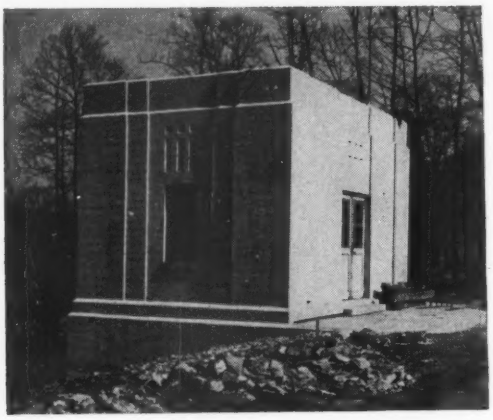
P *Public Works*

August

32. Modern Plant Solves Difficult Packing Plant Waste Problem. By D. H. Hurst. Pp. 11-12.
33. *n.* Baltimore Sells Sewage Effluent to Steel Plant. P. 38.

Company Entitled To Hydrant Rental

A village ordinance authorized the mayor and clerk to enter into a contract with a water company by which the latter agreed to maintain sixty-one fire hydrants, the village to pay a stated yearly rental per hydrant for fire protection. In an action to recover for hydrant rentals for a number of years the Ohio Court of Appeals held (Baxter v. Village of Manchester, 28 N. E. 2d 672) that the village, having received the benefits under the contract, was estopped to assert that it was entered into but two days after the passage of the ordinance and before its publication or effective date and that it was therefore invalid. Judgment for defendant was therefore reversed and the case remanded for further proceedings.



Gate house at sedimentation tank of Ashland, Ky., waterworks.

The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

New Steam Pumping Plant

A new pumping plant for Springfield, Mo., built in 1939, uses steam power because of high electric power rate and remoteness of plant from electrical supply with correspondingly greater necessity for standby equipment. Two 225 hp Stirling boilers use coal brought by truck, and drive four steam turbines, which operate pumps and also generators to furnish power for low-lift pumps three miles away.[G25]*

Algae as Clean Water Indicators

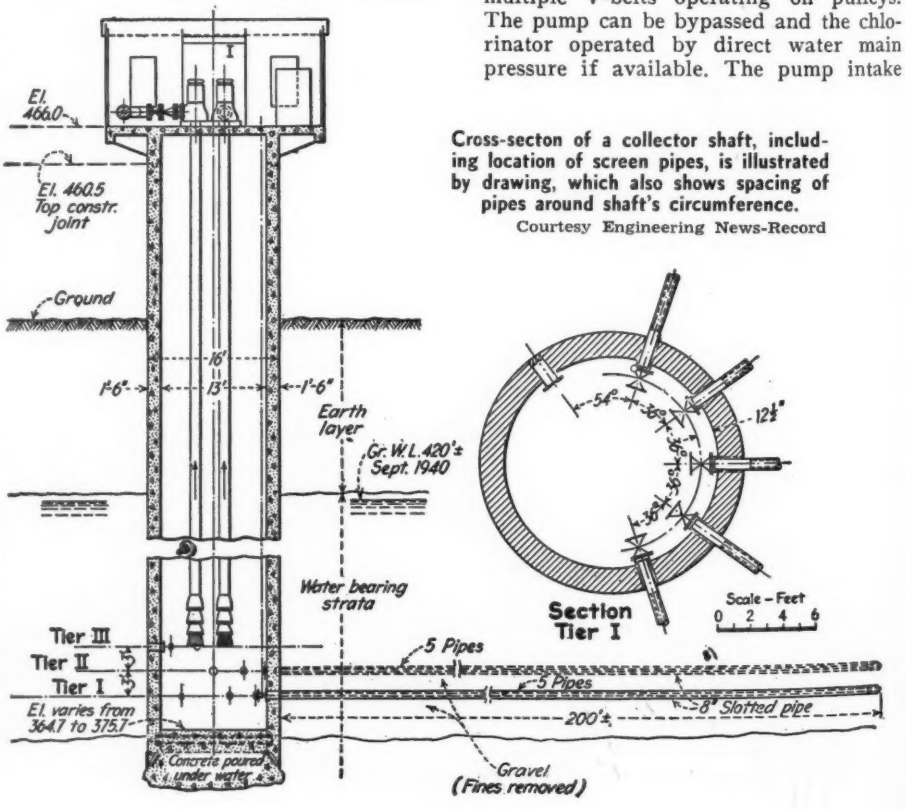
Relatively few plankton organisms show clear-cut responses to pollution or its absence. But two classes of algæ, the olive-green flagellates (Cryptophyceæ) and the yellow-green flagellates (Chrysophyceæ) have been found to react, as a group, adversely to pollution. They seem to be indicators of clean, unpolluted water if they are present in moderate or great abundance. Both of these classes are composed of small flagellates, most of which are known only to biologists. Five genera, however, are common—Cryptomonas, Mallomonas, Synura, Uroglenopsis and Dinobryon. Observations in the Ohio River valley found 13 genera of Chrysophyceæ which, with one exception, are abundant in clean water, show a very sharp decrease in foul water, and recover but slowly in water which is gradually becoming purified below a sewer outfall.[A87]*

Radial Wells Supply 49,000 GPM

Perhaps the largest single groundwater project in the world, recently put into operation, is a radial well installation to provide 49,000 gpm for the War Dept.'s Charlestown, Ind., smokeless powder plant. Seven collectors are spaced about 1800 ft. apart along the Ohio river, 13 ft. diameter and 80 to 110 ft. deep; and ten to fourteen 8″ slotted screen pipes are driven radially from the bottom of each horizontally into a sand and gravel water-bearing stratum. About 1280 ft. of screen pipe are driven from each collector, giving low infiltration velocity with high total inflow of clear water requiring no treatment, of uniform 60° temperature throughout the year, with iron content of less than 0.01 ppm.

Each collector was sunk as a concrete caisson with 18″ reinforced concrete walls having a steel cutting edge at the bottom. When it had been sunk to the desired depth a reinforced concrete bottom was placed by tremie. The screen pipes, of ⅜″ copper-bearing steel with 2″ by ⅜″ slots, were then jacked out through portholes in the collector wall. Each pipe carried in front a diaphragm, in the center of which was a 2″ hole through which sand and fine gravel was washed back into the collector, leaving open, porous gravel surrounding the pipe with 3 to 6 ft. diameter throughout its length. Two 6″ 100-ton hydraulic jacks were used for pushing out the pipes, the longest of which was 257 ft. Each pipe has a valve by which it can be closed for dewatering the well if desired.[E11]

HOW TO FIND ORIGINAL ARTICLES. Key letter at end of each digest refers to name of publication listed in bibliography at end of this section. Numeral indicates title of article.



Cross-secton of a collector shaft, including location of screen pipes, is illustrated by drawing, which also shows spacing of pipes around shaft's circumference.
Courtesy Engineering News-Record

A Portable Chlorinating Unit

San Francisco, Calif., uses a portable chlorinating unit for sterilizing new mains, during repairs on regular chlorinating stations, chlorinating new distributing reservoirs and other purposes. The unit consists of a 300 lb. vacuum chlorinator, a gasoline engine-driven water pump and two 150 lb. chlorine cylinders mounted on a 4-wheel trailer. The chlorinator is high-pressure type, manually operated, equipped with various sizes of injector throats and manometer tubes to feed from 10 to 300 lb. a day. The pump is a triplex, 3-cylinder reciprocating, operating against pressure up to 300 lb., connected to the pump by multiple V-belts operating on pulleys. The pump can be bypassed and the chlorinator operated by direct water main pressure if available. The pump intake

*See Bibliography in August issue.

is 2", equipped to connect to all sizes of standard pipe and fire hose. Discharge is through 200 ft. of steel-wrapped rubber hose. The entire unit is housed in a steel body welded to the trailer frame, but with side and end panels removable. It cost about $2,500.[A103]

Cost of Operating Automotive Equipment

Data from 26 U. S. cities of 100,000 to 200,000 population, operating 660 cars and trucks, show costs of operation as follows: Miles per gallon, av. 10.26, min. 6.7, max. 13.1. Cost per mile at actual cost of gasoline, av. 3.078 ct., min. 1.62 ct., max. 6.8 ct. Cost per mile at 10 ct. per gal., av. 2.928 ct., min. 1.63 ct, max. 6.28 ct. Cost of oil, av. 8.31% of gasoline cost, min. 4.3%, max. 17.2%. Repairs, tires and battery cost, av. 51.7% of net cost (without insurance or depreciation), min. 34.4%, max. 74.4%. Insurance and depreciation (given for only 4 fleets) av. 21.5% of net cost, min. 11.65%, max. 31.0%. For 136 cars only, av. was 12.76 mi. per gal.; for 183 ½-ton trucks, av. was 11.48 mi. per gal.; for 13 ¾ and 1-ton trucks, 10.47 mi. per gal.; for 118 1½ to 3-ton trucks 7.26 mi. per gal.; 4 to 5-ton trucks 6.54 mi. per gal. [A106]

Automatic Control In Tacoma, Washington

Automatic recording and pressure control devices are used in the Tacoma water system to improve pressure conditions, lessen demands on operators, provide the department with basic information for making additional future improvements, and for establishing facts in damage suits. There are 8 hydraulically operated automatic pressure-reducing valves, an 8" cone valve maintains water level in one standpipe, a 12" plunger flow type in another. At another standpipe two 16" cone valves operate as altitude or relief valves, with an opening or closing time of 15 min. because of the 13 miles of pipe back of them. At one point a 12" plunger flow type reducing valve and a 4" needle type, installed in parallel in a 16" pipe line, reduce the pressure from 130 lb. to 30 lb., the smaller valve taking care of night flows and the larger for day flow or night emergency. There are 23 pressure recording gauges; 11 water level recording instruments and 5 flow recorders; high and low pressure alarm gauges at several points, and transmitters and recorders of the percentage opening of automatic cone valves.[A94]

Water Works Use of Radio

Water works use of radio is strictly limited by F.C.C. regulations to emergencies or to communication between isolated points where there are no telephone facilities. Special emergency stations for this purpose have been installed by a few cities—Little Rock, Ark.; Buffalo, N. Y.; Beaumont, Tex., and Los Angeles, Calif., the last having 8 stations. Cost of FM ultra-high frequency equipment ranges from $2,000 for a 250-watt station transmitter to $275 for 25-watt transmitter; $200 for a receiver; $75 to $15 for antenna, and 40 to 75c per foot for gas-filled feed line.[A91]

Reforestation Of Waterworks Properties

The planting and care of a forest adjacent to the average small water supply reservoir will probably never be financially profitable; but it improves the property, pine and spruce trees near the edge of a reservoir prevent leaves blowing into the water, trees prevent soil erosion, provide attractive recreational areas, may in time provide a profitable timber crop, and stimulate owners of waste land to plant it to forest trees. Probably 40% of young trees will die the first year or two, forest fires must be guarded against, disease and insects may damage the trees; plantings near highways are subject to thievery.[A92]

Selecting Employees

Wichita, Kan., in selecting employees for its water works which it began operating last fall, endeavored to base this on merit and fitness, except that, between those of equal qualifications, preference was given to local men. For each position, examinations were taken under the supervision of the head of the political science department of the University of Wichita,

the papers being identified by number rather than name of applicant, and graded by professional committees appointed for the purpose. Final elimination among the high ranking candidates was made on the basis of personal interviews conducted by members of the rating committees, with a city representative sitting in.[A98]

Hexametaphosphate And Lead Corrosion

Hexametaphosphate in concentrations of 10 ppm or less inhibits corrosion of lead pipe by forming a resistant film on the surface. This is most marked at about pH 6. More concentrated solutions not only do not inhibit corrosion but themselves attack the lead.[A93]

Bibliography of Waterworks Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

A *Journal, American Water Works Ass'n*
July

90. Management of Water Works. By L. R. Howson. Pp. 1161-1165.
91. Emergency Radio Communication. By W. V. Weir. Pp. 1166-1174.
92. Reforestation of Ohio Water Works Properties. By T. R. Lathrop. Pp. 1175-1178.
93. Inhibition of Lead Corrosion With Sodium Hexametaphosphate. By G. B. Hatch. Pp. 1179-1187.
94. Automatic Recording and Control Devices in Tacoma's Water System. By W. A. Kunigk. Pp. 1188-1198.
95. Water Supply at Cincinnati. By C. A. Eberling, R. E. Duhme, C. Bahlman, W. Sahud, J. H. Rimmer, M. F. Hoffman and E. F. Alexander. Pp. 1199-1217.
96. A 100% Meterization Program. By E. Robbins. Pp. 1218-1220.
97. Methods of Handling Sand and Gravel. By M. P. Crabill. Pp. 1221-1232.
98. Operation Problems in the New Wichita Water System. By M. E. Rogers. Pp. 1233-1241.
99. Should Larger Portions of Water be Tested for Coliform Bacteria? By R. E. Noble. Pp. 1242-1248.
100. *t.* Fundamentals of Corrosion. By G. W. Gleeson. Pp. 1249-1262.
101. Gastro-Enteritis Epidemic in a Large Office Group. By J. C. Geiger, A. B. Crowley and C. G. Hyde. Pp. 1263-1270.

August

102. Chlorination Equipment Available for Emergency Use. By H. A. Faber. Pp. 1319-1326.
103. Experiences with Emergency Chlorination Equipment. By G. E. Arnold. Pp. 1327-1333.
104. The Pollution and Emergency Disinfection of Rochester's Water Supply. By E. Devendorf. Pp. 1334-1356.
105. Survey of Water Main Extension Policies. By L. A. Jackson. Pp. 1357-1361.
106. Control of Automotive Equipment. By L. A. Geupel. Pp. 1362-1372.
107. Meter Reading and Commercial Dept. Operation. By K. K. King. Pp. 1373-1380.
108. Survey of Meter Maintenance Practice. By A. P. Kuranz. Pp. 1381-1388.
109. Water Rate Structures in Canada. By A. E. Berry and W. Storrie. Pp. 1389-1401.
110. Boiler Feedwater Studies. Report of Joint Research Committee. Pp. 1402-1408.
111. Studies in Corrosion Control. By H. P. Stockwell, Jr. Pp. 1409-1428.
112. Investigating Water Quality in a Distribution System. By A. M. Shannon and W. M. Wallace. Pp. 1429-1439.
113. Protection of Utility Services in Wartime. By W. H. Wood and C. J. Pulham. Pp. 1440-1447.

E *Engineering News-Record*
July 31

10. *c.* Passing Faults on the Delaware Aqueduct. Pp. 40-44.
11. *c.* Radial Wells for Powder Plant Water Supply. Pp. 45-47.

August 14

12. St. Paul Softens Water Cheaply. By R. A. Thuma. Pp. 80-82.

F *Water Works Engineering*
July 30

73. Making Honolulu Water Conscious. By C. E. Hogue. Pp. 936-939.
74. Coulee Beds Used for Reservoir at Langdon, N. D. By E. J. Franta and A. C. Mukomela. Pp. 942-944.
75. Wells as a Supply Source. Pp. 947-948, 957.

August 13

76. Results at the Raleigh, N. C., Filter Plant. By N. N. Wolpert. Pp. 984-987.
77. A Fluorine Study of Arizona Wells. By H. V. Smith and T. Evans. Pp. 988-990.
78. International (Maine-New Brunswick) Water System. By H. E. Lamb. Pp. 991, 992, 1015.
79. Maintenance Crews Provide the First Line of Defense. By C. L. Link. Pp. 1001, 1014.
80. Drought of 1941 Has Affected Surface and Groundwater Supplies. P. 1005.

G *Water Works & Sewerage*
July

30. The Mechanism of Corrosion of Water Pipes. By T. M. Riddick. Pp. 291-298.
31. Testing Water Meters in St. Louis. By R. M. Bell. Pp. 311-317.
32. Paddle Wheel Stirring. By R. D. Nichols. Pp. 325-329.

L *Civil Engineering*
August

5. Chemical Composition of Ground Waters. By M. R. Huberty. Pp. 494-495.

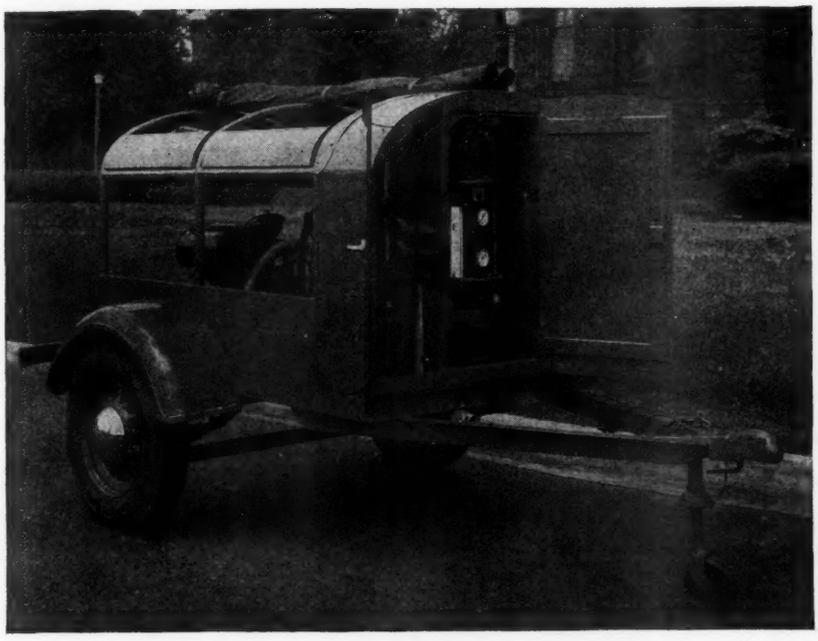
M *Water and Sewage*
July

21. *p.* Experiences with Cathodic Protection of Water Tanks. By J. C. Keith. Pp. 29, 72-76.
22. *p.* Charges for Municipal Services and Fire Protection in Canada. By W. Storrie. Pp. 31, 85-88.
23. *p.* Emergency Radio Communications for Water Supply Systems. By W. V. Weir. Pp. 56, 58.

P *Public Works*
August

38. Chlorination at or Near the Breakpoint. By J. M. Wardle. Pp. 14-16.
39. Sanitation, Maintenance and Control of Watersheds. By F. H. Whitley. Pp. 17-38.
40. *n.* Applying Copper Sulphate to Reservoirs. P. 38.

Keeping Up With New Equipment



Wallace & Tiernan Mobile Chlorinator for Emergencies

Mobile Chlorinator for Emergency Service

Wallace & Tiernan Co., Inc.
P. O. Box 178, Newark, N. J.

This is a trailer type mobile chlorinating unit, designed to provide positive protection of water supplies under emergency conditions or to meet other temporary needs for chlorination.

The unit provides for closely controlled solution feed of chlorine over a wide range of application rates. Especially designed, of particularly rugged construction, the chlorinator employs the well known W&T vacuum principle. The chlorinator operates with all the accuracy and dependability which are characteristic of W&T apparatus. Powered by a 5 h.p. gasoline engine mounted on the trailer, a self-priming pump will deliver the required injector water at sufficient pressure to apply 100 lbs. of chlorine per day against a maximum pressure of 100 lbs. per sq. in. in the main. Two 150 lb. chlorine cylinders are cradled in the trailer, connected in manifold to assure continuity of supply. The chlorinator is equipped with a complete set of accessories including corporation cocks, hose, tubing and fittings for emergency use in connecting to mains, and with all the necessary tools for the work. A Comparator for making tests of chlorine residuals has a self-contained light source for use at night.

In the light of considerable data and information from British sources, this unit has been designed to meet emergency conditions as found in English experience during the past two years. It is designed to maintain accuracy of operation despite transport over long distances or rough roads. A retractable third wheel provides stability when disconnected from the towing vehicle. Gross weight complete including two 150 lb. chlorine cylinders is 2150 lbs.

Specialists in defense emergency chlorination have been designated by W&T to study all available information from British sources. These men, especially qualified to survey chlorination needs with respect to emergencies, are available to supplement the work of the regular W&T field representatives and will gladly make recommendations to any water works, without obligation.

For complete information on the new Emergency Chlorination Trailer and requests for the services of one of the W&T specialists, call your nearest W&T representative or write Wallace & Tiernan Co., Inc.

Rubber Joint Sealer for Concrete Runways

Rubber Associates, Inc.,
Rockefeller Center, New York, N. Y.

For the more than 165,000 square yards of concrete runways in the new Toledo Airport completed this spring, city engineers used a new rubber compound of the hot-poured type that is said to seal the expansion and contraction joints during all movement of the slabs.

More than 33,000 pounds of the quick-hardening substance, known as Rai-Seal, was required for the job.

Specifications for the airport called for a joint sealer which would have three essential characteristics: adhesion to concrete surfaces, resiliency at low temperature while being extended, and non-flowing properties at continued summer temperatures while under compression.

The manufacturing company, Rubber Associates, Inc., claims that this lasting quality will cut down materially on upkeep charges, and in addition will prevent infiltration of water and foreign materials between slabs, with consequent breakage.

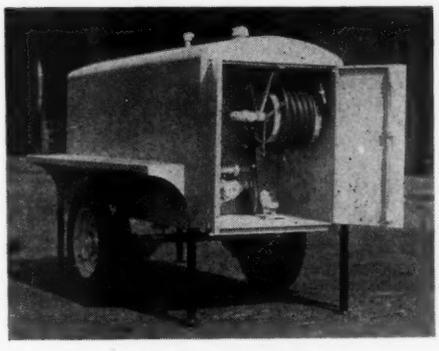
The method of installing Rai-Seal is essentially the same as that for bituminous materials. It is melted at 400 to 450 degrees F. in a regular heating kettle, poured into the joint, and may be exposed to traffic in from ten to twenty minutes.

The new product is made in concrete color to blend with new concrete pavements and structures, and in black for resealing.

Portable Diesel Tenders

Littleford Bros.
453 East Pearl St., Cincinnati, Ohio

This new piece of equipment provides a flexible method of refuelling for the various equipment anywhere at any time. You simply turn the crank on the hand pump and pump out any desired amount of diesel oil. A compartment for tools is built into the outfit.



Littleford Diesel Tender

Armco Bonded-Asbestos Sewer Pipe To Be Exhibited at Federation of Sewage Works Association

Armco Drainage Products Assn.
Middletown, Ohio

The uses and economy of Asbestos-Bonded ARMCO Sewer Pipe will be demonstrated in the exhibit of the ARMCO Drainage Products Association at the second annual show of the Federation of Sewage Works Associations at the Hotel Pennsylvania in New York City, October 9-11. The display will show its effectiveness for large and small municipalities storm and sanitary systems.

In producing this sewer pipe, ARMCO Ingot Iron is first coated with

molten zinc. As the metal leaves the galvanizing rolls, a layer of asbestos felt is pressed into the hardening zinc where millions of fibers become imbedded. Before the pipe is formed the fibers are thoroughly saturated with a special high-grade bituminous material. When the usual dipping operations are performed the hot bitumen naturally melts with the bituminous saturant on the pipe and forms an integral coating. Where the hardest wear comes, in the sewer invert, a special pavement of bituminous material is laid.

Representatives of ARMCO who will attend the show are H. E. Cotton and W. H. Spindler.

New folder

Fuelling Tank for Airports Prevents Evaporation and Fire Hazard, Eliminates Dirt

Aqua Flotation Systems
385 Gerard Ave., New York, N. Y.

There is no air space in the tank, consequently no vent for vapors to escape, and no fire hazard. The entire tank is kept completely filled with liquid. The balance between gasoline and water is maintained automatically by shut-off floats.

Gasoline floats on water. Any dirt falls to the bottom of the tank through the water. In filling gasoline displaces an equal volume of water which flows out through the drain. As fuel is withdrawn water automatically rises to float the gasoline out of the tank.

New folder giving full information.

Fairbanks-Morse Pumps

New Line of Short-Coupled Horizontal Motor-Driven Pumps Announced
Fairbanks, Morse & Co.
600 So. Michigan Ave., Chicago, Ill.

These Figure 6720X pumps are designed primarily for pumping into the open, such as an irrigation ditch.

The standard unit is supplied complete with motor, base and coupling. The pump is so constructed that no bearings are necessary in the pump itself and the motor bearings are grease packed at the factory so the unit requires a minimum of attention and maintenance.

The impeller position can easily be adjusted by loosening the set screws in the bronze shaft collar and shifting the pump shaft. When wear occurs, close clearance can thus be secured between the impeller and the volute and the original high efficiency of the pump maintained.

The Figure 6720X pumps are driven by Fairbanks-Morse ball-bearing motors, equipped with the modern feature, the famous Copperspun Rotor. Both the pump and the motor are designed and built complete by Fairbanks-Morse, thus centering responsibility for satisfactory performance in one reliable manufacturer.

Another feature is that the semi-trash impeller passes large solids which make this pumping unit admirable for irrigation service where leaves and other debris may be encountered.

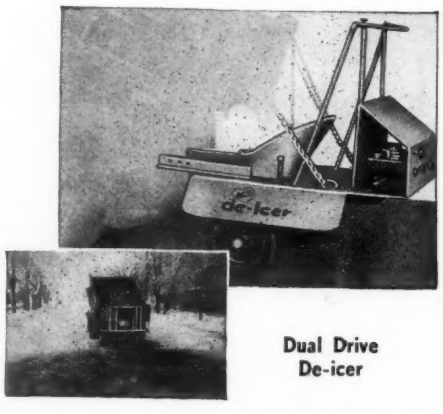
When pumping out of a shallow well or sump, these pumps can be installed at ground level, or if the water supply is beyond suction lift, it can often be brought into reach by installing a pump in a dry pit.

A four-page bulletin describing the complete line of 6720X motor-driven pumps has just been released by Fairbanks, Morse & Co. for distribution and a copy will be sent to engineers interested in same.

Dual Drive De-icer

Ace Equipment Co., Oshkosh, Wis.

A dual drive de-icer, for use on roads and streets, and that can be used with or without the engine, is announced by Ace Equipment Co., Oshkosh, Wisconsin, national distributors for Huebner Mfg. Co. It will handle all materials, at all speeds and under all operating conditions, and is said by the manufacturer to be low in cost and safe to use. Illustrated here is the unit attached to a truck. It can be operated by standing down on the platform where the operator is close to the ground; standing in the truck box; backwards, which is ideal for backing trucks up slippery hills; or forwards at any truck speed. Spread is dependent on rate of truck travel when the de-icer is used with motor. This new dual unit has these distinctive features, the manufacturer points out: safety lights, sand suppressor that permits the operator to protect oncoming traffic, mercury automatic clutch that automatically "breaks" the power flow when the unit is stopped by rocks, etc. or when engine is turned off, and dual drive that requires less than five minutes to change from one to another. Other features are standard tire width, adjustable deflectors, self feeding hopper, inverted cone type agitator, and all standard parts throughout. It is made of boiler steel plate, electro-welded at all vital points, and weighs 550 pounds.



Dual Drive De-icer

K&M "Century" Asbestos-Cement Pipe

Now available in 18 foot lengths in 6" and 8" sizes, Class 150

Keasbey & Mattison Company, Ambler, Pa., has recently come out with a light weight asbestos-cement pipe available in 18 foot lengths.

K&M "Century" A-C Pipe, in the new 18 foot lengths, is available in 6" and 8" sizes, Class 150. These longer lengths eliminate 113 couplings per mile of line. The installation time saved speeds up pipe laying and cuts costs.

"Century" 18 foot pipe is particularly desirable on long stretches of line. It means 28% fewer joints, thus substantially reducing the installation cost of the project.

K&M "Century" 13 foot pipe is still available for those cases where trench conditions make shorter lengths more advantageous. The proper lengths to be used on a particular job should be based on a thorough consideration of the problems at hand.

Porous Underdrain Systems

for Rapid Water Filters and Softeners

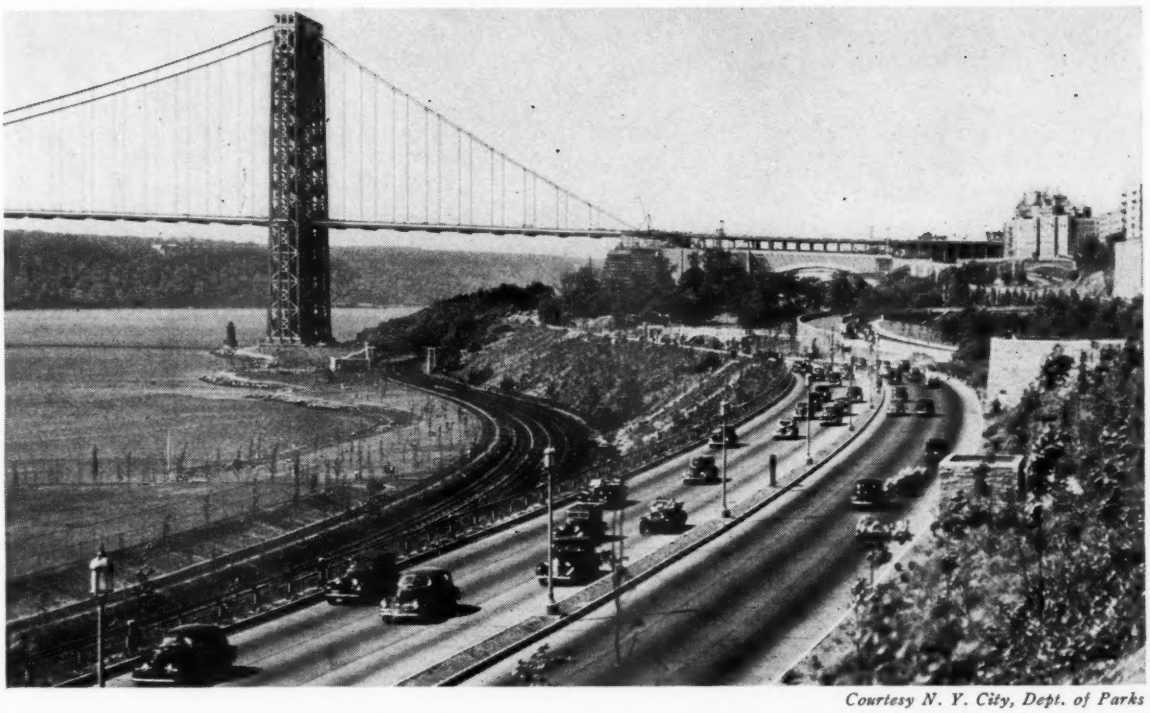
The Carborundum Co.,
Niagara Falls, N. Y.

In Engineering Bulletin No. 2, this company describes how Aloxite Brand plain and channelled plates have been developed. The manufacturer claims that they will completely eliminate all graded gravel in filters; corrosion, disintegration, clogging and loss of sand. Even if backwashing were non-uniform, the filter cannot be upset as only one grade of filter media is used, and lateral movement will cause no trouble. That is an outstanding benefit in the use of Zeolites for water softening because of the relative value of such materials.

The Bulletin contains illustrations of the plates and plans for utilizing the Underdrain Plates.

Those interested in water treatment would find this Bulletin interesting and valuable.

Come to New York
in October!



Courtesy N. Y. City, Dept. of Parks

TO THE SECOND ANNUAL CONVENTION OF THE

Federation of Sewage Works Associations

HOTEL PENNSYLVANIA, OCT. 9-10-11

OUTSTANDING TECHNICAL PROGRAM

Addresses and discussion by engineers and sewage plant officials of national and international distinction.

COMPLETE MANUFACTURERS EXHIBIT

See under one roof *all* the latest sewage works equipment, displayed under ideal conditions for quick appraisal.

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The opportunity of the year to see New York City's great new sewage disposal plants at work.

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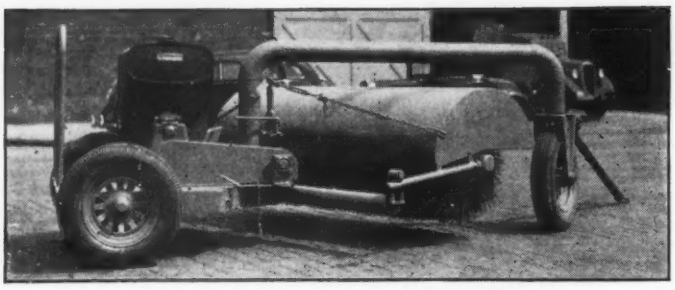
In addition to all of New York's world-famous facilities for entertainment, there will be luncheons, smoker, dinner, ladies entertainment, and reunion features.

This is the best month of all and the best occasion of the year for sewage works men to see the great metropolis. For any detailed information, write W. H. Wisely, Executive Secretary, P. O. Box 18, Urbana, Ill. But COME!

This advertisement sponsored by

PUBLIC WORKS

"MORE THAN A SEWAGE WORKS MAGAZINE"



Littleford Power Driven Two-Way Broom

Two-Way Traction Driven Road Broom

Littleford Bros.
453 E. Pearl St., Cincinnati, Ohio

Outstanding features are the hydraulic lift with which the brush can be raised clear of the road surface by merely pumping the handle a few times; simplicity of construction. There are only 3 wheels, making it easy to turn in a small radius which also means saving in tires and bearings.

There are no complicated working parts. Any mechanic can keep it in repair.

The entire brush assembly is hinged in the center and is free to swing to right or left. Direction is reversed by lifting a small catch. The broom is powered with a 4-cylinder air-cooled engine which experience has shown to be the best for broom service.

Priority Ratings for Highway Construction

A procedure for the establishment of appropriate priority ratings for highway projects has recently been approved. The plan will operate substantially as outlined in our Priorities Release of August 15, 1941. Authority for this plan was granted in a letter dated August 30, 1941, addressed to Thomas H. MacDonald, Commissioner, Public Roads Administration, from E. R. Stettinius, Jr., Director of Priorities. There follows in substance the provisions of this communication.

Excerpts From Official Order

It is considered important to the national defense to expedite the construction of highway projects conforming to the classes described below and administered by the Public Roads Administration and the several state highway departments. Accordingly, the Public Roads Administration and the state highway departments are hereby authorized in letting contracts and in obtaining materials and equipment necessary for the completion of these projects, for deliveries prior to June 30, 1942, to *indicate* to prospective contractors and suppliers that deliveries of such materials will, upon proper authentication and application, be assigned when necessary, the preference rating specified for the following classes of projects:

Access Roads: a. Access roads to military and naval establishments—Preference rating of the access road project shall correspond to the rating of the military and naval establishment served; that is, a naval air station or army air base will have a rating of *A-1-e,* and an army cantonment other than air corps will have a rating of *A-1-j.* b. Access roads to defense manufacturing establishments—Preference rating of the access road project shall correspond to the rating of the defense establishment served except that the highest rating which can be assigned is *A-1-e.*

Strategic Network of Highways: a. All bridges, tunnels, structures and approaches—*A-2* rating. b. New roads or the improvement of substandard roads and grade separation structures—*A-4* rating. c. Shoulder widening and minor drainage structures—*A-10* rating. d. All other work—*B-3* rating.

Federal Aid System: a. All bridges, tunnels, structures and approaches—*A-3* rating. b. New roads or the improvement of substandard roads and grade separation structures—*A-7* rating. c. Shoulder widening and minor drainage structures — *A-10* rating. d. All other work—*B-3* rating.

Federal Aid, Secondary and National Park and Forest Projects: a. Bridges and approaches—*A-7* rating. b. New roads or the improvement of substandard roads and grade separation structures—*A-10* rating. c. All other work —*B-3* rating.

Projects for the construction or improvement of the Inter-American Highway: A-3 rating.

Construction of the Trans-Isthmian Highway and the Chorrera-Rio Hato Highway in Panama: A-1-b rating.

In letting contracts based upon the proposed assignment of the preference ratings indicated above, the Public Roads Administration and the several state highway departments may furnish contractors and suppliers photostatic or multilith copies of this letter.

If priority assistance is required in order to obtain deliveries or materials, supplies and equipment on schedule, an application shall be made by the state highway department concerned through the Public Roads Administration to the Project Section, Division of Priorities, Office of Production Management, for the issuance of a Preference Rating Order. If the circumstances set forth in the application warrant the assignment of a preference rating the Director of Priorities will thereafter issue a Preference Rating Order assigning the appropriate rating specified above to deliveries of material.

Each state highway department shall forward to this office monthly a list showing the names and addresses of all suppliers to whom a copy of this letter is furnished and the date when so furnished.

This letter may be recalled by the Director of Priorities whenever deemed necessary in the proper exercise of his duties and responsibilities.

Tricosal—An Admixture for Concrete

Eastern Tricosal Company, Inc.,
101 Park Ave., New York, N. Y.

In his folder the manufacturer of Tricosal describes it as a neutral liquid containing chemically modified protein derivatives, which have marked colloidal and dispersing properties. It contains no fats or tars, is not sulphated, and is claimed to develop the best inherent properties available in cement and aggregate, thus promoting the uniform, speedy and thorough hydration of the cement grains with a minimum of water.

Tricosal has been marketed in the West for a number of years past and the above company is promoting its sale in the East.

Link-Belt Helps Speed Defense Production

With 80% of its output consisting of either direct or indirect orders for national defense material, Link-Belt Company has published an interesting, two-color booklet illustrating the many different types of equipment they produce for speeding up defense work production. Entitled *". . . Just Another Job,"* copies may be had on request to Link-Belt Company, 307 North Michigan Ave., Chicago, Ill.

Syntron Equipment

The Syntron Company,
660 Lexington Ave.,
Homer City, Pa.

A new 48-page catalog that shows many ways by which: Electric Hammers can be used to effect substantial labor savings, Concrete Vibrators used to improve the quality of concrete products and structures and, in addition, gives a full and complete description of their peculiar and unique line of Vibratory Material Handling Equipment. Copies are available upon request.

Universal Cast Iron Pipe

Central Foundry Co.,
386 Fourth Ave., New York, N. Y.

This new 104-page catalog gives complete information regarding Universal Cast Iron Pipe and Fittings which require no caulking or pouring of lead or lead substitutes to make the Universal joints. It is only necessary to pass two bolts through the lugs attached to the ends of the pipe and tighten with a ratchet wrench. It is made in 6 ft. lengths, easy to handle. Write for a copy of this interesting catalog.

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When you need special information—consult the *classified* READER'S SERVICE DEPT., pages 69-71

PEOPLE . . . *Here and There*

New Sales Agency For the Water Works Market

Fred E. Stuart and Al. Brumley have formed a partnership corporation with offices at 516 North Charles Street, Baltimore, Md., to handle the sales of the Activated Alum Corporation of which they are respectively President and Vice President, and to act as sales agents for manufacturers of other products adapted for water works systems.

The decision to form this sales organization was based upon the experience of these men in acting as sales representatives for Palmer Filter Bed Agitators, Gray Company's Activated Carbon, Cape May Filter Sand, General Reduction Company's Bleaching Clay, Phipps & Bird Laboratory Stirring Machine and The Tate Main Cleaning and Cement Lining Process. All of these were formerly marketed under the name of the Activated Alum Corporation. Activated Alum Corporation will continue to produce at plant capacity in Activated and Black Alum. The only change being that the Stuart-Brumley Corporation will handle the sales.

The sales agency now has representatives in Charlotte, N. C., and Atlanta, Ga. It will concentrate on the Southeastern market and provide high-grade service to those manufacturers they already represent and to those who may be seeking representation and active selling in this active market.

The Charlotte, N. C., office is at 1217 Liberty Life Bldg., and the address of the Atlanta office is 325 Second Avenue, S. E.

Fred Burggraf Now Assistant Director

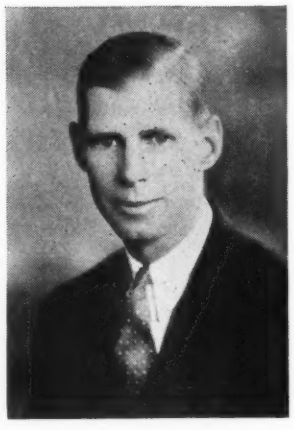
The Highway Research Board recently announced the appointment of Fred Burggraf as Assistant Director.

Mr. Burggraf has been connected with research relating to highways since 1919. His career has included engagements with: the National Bureau of Standards, the Illinois Division of Highways, the Highway Research Board and the Calcium Chloride Association.

Sectional Meetings of American Water Works Association

Twenty-Second Annual Meeting of California Section of American Water Works Association will be held at Fresno, Calif. Oct. 22nd to 25th inclusive.

The Florida Section will hold its annual meeting at Daytona Beach, Nov. 13th to 15th, inclusive. A. P. Black, Sec., University of Florida, Gainesville.



W. B. Marshall

W. B. Marshall Advanced

A number of changes have just been announced by Chain Belt Company of Milwaukee.

Mr. W. B. Marshall, who has been Assistant Sales Manager of the Conveying and Engineering Products Division of the Company, has been made Sales Manager of that Division. Mr. Marshall has been with the Company since 1920. Besides being Assistant Sales Manager, he has been in charge of the development and sales of Sanitation Equipment and has also had experience in field sales work. Mr. Marshall graduated from Sheffield Scientific School of Yale University in 1921.

Col. W. F. Rockwell Appointed by O.P.M.

At a meeting of the Automotive Parts Manufacturers Association in Washington, D. C., on Tuesday, July 22nd, Mr. James Adams of the O.P.M. appointed Colonel W. F. Rockwell as Chairman of the Nominating Committee to select representatives to consult with the O.P.M. on the transfer of automotive activities to National Defense. Colonel Rockwell is Board Chairman of Timken-Detroit Axle Company as well as President of Pittsburgh Equitable Meter Company.

Bailey Meter Company Opens Detroit Office

Bailey Meter Company, Cleveland, Ohio, announces the opening on July 1st of a Detroit Branch Office at Room 226, Curtis Building, under the management of N. M. Barnett, assisted by R. F. Hanson and R. T. Cowan. Each of these engineers has had wide experience in the problems of power plant operation and is thoroughly familiar with specific operating conditions as they prevail in the Detroit area.

Dryden and McDougal Advanced by W.P.A.

Francis H. Dryden, formerly Asst. Commissioner in charge of Division of Operations, has been appointed Deputy Commissioner of W.P.A. R. L. McDougal succeeds Mr. Dryden as Asst. Commissioner in charge of the Division of Operations.

Elrod Made Life Member Of A.S.C.E.

Henry E. Elrod, Consulting Engineer, Houston, Texas, has been made a life member of the American Society of Civil Engineers. During the past 25 years Mr. Elrod has served professionally more than 300 cities, villages and towns.

New Appointments:

The following City Engineers have recently been appointed:

C. C. Conger, Claremont, P. O. Pomona, Calif.
B. H. Scott, Westernport, Md.
C. P. Wells, Havre, Mont.
Ralph Mittendorf, Ironton, Ohio.
D. F. Harvey, Beaver Falls, Pa.
P. A. Goodwyn, Bristol, Va.

New Water Works Superintendents include:

Walter C. Conroy, Belmont, Mass.
William H. Cleaver, Port Clinton, Ohio.
W. B. McDaniel, Bristol, Va.
Albert Wilson, Fredericksburg, Va.

County Engineers recently reported:

G. N. McQueren, Cass, Atlantic, Iowa.
U. U. Shirley, Union, New Albany, Miss.
Joe Plut, Roberts, Sisseton, S. D.

Brigadier-General James A. Anderson succeeds the late Henry G. Shirley as State Highway Commissioner for Virginia. Gen. Anderson was dean of engineering at Virginia Military Institute.

Harold G. Burrill, Consulting Engineer, Baltimore, Md., has been assigned to duty as Major in Ordnance Department, United States Army at Aberdeen, Maryland, where he is Utility Officer in charge of Power, Water and Sewage Disposal.

Dean S. S. Steinberg of the College of Engineering at the University of Maryland has recently been appointed by Governor Herbert R. O'Conor for a term of six years a member of the Maryland Traffic Safety Commission, provision for which was made at the last meeting of the Maryland Legislature. He has been named chairman of the Engineering Committee of the Commission.

Readers' Service Department

These booklets are FREE. Use the coupon below or write the manufacturer direct, mentioning PUBLIC WORKS.

Construction Materials and Equipment

Asphaltic Limestone

5. Characteristics, methods of laying, and results with cold lay mixture shipped ready to use. Especially adapted to resurfacing old pavements, sealcoats and airport runways. Alabama Asphaltic Limestone Co., Liberty Nat. Life Bldg., Birmingham, Ala.

Bituminous Mixer

7. Exact control by volumetric proportioning. Continuous mixing and large capacity. The Barber-Greene mixer can be used as a unit of a travel plant or as a central plant. Excellent and instructive. Well illustrated book on request. Barber-Greene Co., Aurora, Ill.

Cold Mix Plants

10. New catalog and prices of Portable Bituminous Mixers in 6 to 14 ft. sizes for resurfacing and maintenance. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus, Ohio.

Concrete Accelerators

29. "How Cotton Quilts are being used successfully for curing concrete" is a series of reprints from recent magazines available on request from Highway Materials Dept., National Automative Fibres, Inc., Little Falls, N. Y.

30. "How to Cure Concrete," a forty-seven page manual published by the Dow Chemical Company, Midland, Michigan, treats fully subject suggested by title.

31. New 48-page booklet in five sections explains clearly the effects, advantages and methods of using Calcium Chloride and Portland Cement mixes. Complete and packed with practical information; well illustrated; pocket size. Sent free on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

33. Pocket manual of concrete curing with calcium chloride. Complete, handy. Contains useful tables, well illustrated. Write the Columbia Chemical Division, Pittsburgh Plate Glass Co., 30 Rockefeller Plaza, N. Y. C.

Concrete Mixers

44. Catalog and prices of Concrete Mixers, both Tilting and Non-Tilt types, from 3½S to 56S sizes. The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

Drainage Products

70. Standard corrugated pipe, perforated pipe and MULTI PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses are described in a 48-page catalog entitled "ARMCO Drainage Products," issued by the Armco Drainage Products Association, Middletown, Ohio, and its associated member companies. Ask for Catalog No. 12.

71. Modern Culvert Practice — a 72 page book containing valuable data and tables will be sent promptly to anyone interested in drainage by Gohi Culvert Mfrs., Inc., Newport, Ky.

72. "3 Answers to Limited Headroom," a comparison of three ways of providing safe strength and adequate drainage under limited headroom. For copy ask Armco Drainage Products Assn., Middletown, Ohio.

73. "Principles of Design of Airport Drainage" and other articles on airport drainage reprinted from PUBLIC WORKS Magazine are being distributed free by Bowerston Shale Co., Bowerston, O., Hancock Brick & Tile Co., Findlay, O., and Columbus Clay Mfg. Co., Blacklick, O. Address anyone of the above for a copy.

Mud-Jack Method

107. How the Mud Jack Method for raising concrete curb, gutter, walls and street solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities — a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee, Wis.

Paving Materials, Bituminous

111. An excellent booklet issued by The Barrett Co., 40 Rector St., New York, N. Y., describes and illustrates the uses of each grade of Tarvia and Tarvialithic; 32 good illustrations.

114. COLPROVIA PAVING PROCESSES for non-skid pavements include Plant Mixes by both the Heated and Cold Processes, Road Mix Process and Surface Treatment Process. New literature covering these processes is available from Colprovia Roads, Inc., 183 East Main St., Rochester, N. Y.

Paving Materials, Brick

116. "New Developments in Brick Pavements." A review of the developments in brick pavements in recent years. Issued by the National Paving Brick Association, National Press Building, Washingon, D. C.

Pumps

121. New illustrated catalog and prices of Jaeger Sure Prime Pumps, 2" to 10" sizes, 7000 to 220,000 G.P.H. capacities, also Jetting, Caisson, Road Pumps, recently issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

122. CMC pump bulletin illustrates and describes complete line of modern centrifugals made in sizes from 1½" to 10" by Construction Machinery Co., Waterloo, Iowa.

123. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

124. 16-page illustrated bulletin, SP-37, describes and illustrates complete C. H. & E. line of self-priming centrifugal pumps from ½" to 8", including lightweight models for easy portability. C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

Retaining Walls

126. Charts showing the design of cellular or bin-type metal retaining walls, helpful suggestions on their use for stabilizing slopes, preventing stream encroachment, and solving problems of limited right of way, and construction details are given in a 16-page bulletin entitled, "ARMCO Bin-Type Retaining Walls." It is published by the Armco Drainage Products Association, Middletown, Ohio, and member companies. Ask for Bulletin H-37.

127. See road work as it was done in the 1890's and as it can be done by a full line of this year's road building equipment. See, in this new action picture book, the first reversible roller, 1893 World's Fair Award Grader and how methods have changed. Attractive new booklet AD-1796 recently issued by The Austin-Western Road Machinery Co., Aurora, Ill.

128. Motor Patrol Graders for road maintenance, road widening and road building, a complete line offering choice of weight, power, final drive and special equipment to exactly fit the job. Action pictures and full details are in catalogs Nos. 253, 254 & 255, issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

129. New bulletins illustrate and describe the latest line of Littleford Utility Spray Tanks, Street Marking Units, Street Flushers and Kettles. Littleford Bros., 452 East Pearl St., Cincinnati, Ohio.

130. Toro patching rollers, tractors and mowers for parks, airports, estates, highways and golf courses are pictured and detailed in new illustrated booklet available from Toro Mfg. Co., Minneapolis, Minn.

Rollers

133. New Tu-Ton roller of simple construction for use in rolling sidewalks along highways, playgrounds and other types of light rolling is fully described in a bulletin issued by C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

138. "The Buffalo-Springfield line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog issued by the Buffalo-Springfield Roller Co., Springfield, Ohio."

139. "Ironeroller" 3 Axle Roller for extra smooth surfaces on all bituminous work. Booklet contains roller data and operation details. Hercules Co., Marion, Ohio.

Spreader

147. Jaeger Paving equipment, including Mix-in-Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers, Adjustable Spreaders, Forms, etc.— 4 complete catalogs of latest equipment in one cover, issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

Soil Stabilization

150. "High-Service, Low Cost Roads" is one of the newer booklets using an effective combination of picture and text to set forth the principals and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated. 34 pages. Sent by Solvay Sales Corp., 40 Rector St., New York, N. Y.

152. The Columbia Alkali Corporation, will be glad to furnish to anyone interested complete information dealing with Calcium Chloride Stabilized Roads. This literature contains many charts, tables and useful information and can be obtained by writing Columbia Alkali Div., Pittsburgh Plate Glass Co., 30 Rockefeller Plaza, New York City.

154. "Soil Stabilization with Tarvia" —An illustrated booklet describing The steps in the stabilization of roadway soil with Tarvia will be mailed on request by The Barrett Company, 40 Rector St., New York, N. Y.

Tractors

159. "International Diesel TracTracTors" is a 48-page catalog giving full details of TracTracTors, including action pictures with bulldozers, bullgraders, blade graders, wheel scrapers, elevating graders, etc. Sent promptly by International Harvester Co., 180 North Michigan Ave., Chicago, Ill.

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9-41

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(Indicate by numbers)

Name .....

Occupation .....

Street .....

City ..... State .....

Readers' Service Department

(Continued from page 69)

Street and Paving Maintenance

Asphalt Heaters

198. Illustrated Bulletins 15 to 20 describe Mohawk Oil Burning Torches; "Hotstuf" Tar and Asphalt Heaters; Portable Trailer Tool Boxes; Pouring Pots and other equipment for street and highway maintenance, roofing, pipe coating, water proofing, etc. Mohawk Asphalt Heater Co., Frankfort, N. Y.

Dust Control

210. "How to Maintain Roads with Dowflake" is a new 58 page illustrated booklet of information on stabilized road construction. Includes specifications and several pages of reference tables from an engineer's notebook. Issued by Dow Chemical Co., Midland, Mich.

211. A complete booklet on dust control titled, "Dust Control and Road Stabilization," describes the use of Columbia Calcium Chloride for dust control purposes and stabilization of roads. Sent on request by Columbia Alkali Div., Pittsburgh Plate Glass Co., 30 Rockefeller Plaza, New York, N. Y.

212. "Are You Annoyed by Dust?" an illustrated circular telling how to prevent dust with calcium chloride. Sent free by Michigan Alkali Co., 60 East 42 St., New York, N. Y.

Radio Communication, Two Way

250. Valuable information on how cities and towns all over the country have solved their radio communication problems is found in "Motorola Radio Communication Equipment." Write Galvin Mfg. Corp., 4545 West Augusta St., Chiccago, Ill.

Sprayers

280. Cutback sprayers with new "single unit safety control" and full control of all spraying operations from the nozzle are described and illustrated in new bulletin No. 190 W issued by Aeroil Burner Co., Box 599, West New York, N. J.

Street Markers

300. Street marking simplified by the use of modern, self-contained units capable of handling any kind of striping jobs is the subject of an illustrated bulletin giving also full details of new M-B Street Markers. Sent by Meili-Blumberg Corp., Box PW, New Holstein, Wis.

Snow Fighting

Plows

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Features, specifications and method of attaching. Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

Ice Control

351. "Make Icy Highways Safe for Traffic"—a new bulletin by Michigan Alkali Co., 60 East 42 St., New York, N. Y., tells how to use calcium chloride for modern ice control.

Sanitary Engineering

Activated Alum

354. "Technical Data on Activated Alum and Dustless Blackalum" points out the analytical side of Activated Alum and Blackalum. Write Activated Alum Corp., Curtis Bay, Baltimore, Md.

Aero-Filter

356. New illustrated bulletin gives complete information on design of Aero-Filters to provide high-capacity, uniform, raindrop application over the entire filter bed. Write Lakeside Engineering Corp., 222 West Adams St., Chicago, Ill.

Air Release Valves

357. Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia, Pa.

Analysis of Water

360. "Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Activation and Aeration

376. A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability. 20pp. illustrated. Sent on request to Norton Company, Worcester, Mass.

Cleaning Mains

381. "Let's Look Into the Matter of Water Main Cleaning" is an illustrated booklet outlining the advantages of water main cleaning and explains how it can be done quickly and inexpensively by The National Method. Write National Water Main Cleaning Co., 30 Church St., New York, N. Y.

382. "Reconditioning Large Water Mains" and "Cement Linings of Large Diameter Mains in Place" are two interesting pamphlets available from Centriline Corp., 140 Cedar St., New York, N. Y.

Cleaning Sewers

383. A 20-page booklet describes and illustrates a full line of sewer cleaning equipment—Rods, Root Cutters, Buckets, Nozzles and Flushers. Write W. H. Stewart (Pioneer Mfr. since 1901), Jacksonville, Fla., or P. O. Box 767, Syracuse, N. Y.

384. A new 32-page, illustrated booklet explains how a city can clean its sewers and culverts with its own forces using the up-to-date Flexible Sewer Rod equipment. Illustrates and describes all necessary equipment. Issued by Flexible Sewer Rod Equipment Co., 9059 Venice Boul., Los Angeles, Calif.

Corrosion Prevention

385. Enamels and coatings to protect pipe lines, sewage plant structures and equipment against corrosion. Recommendations for any problem. Wailes Dove-Hermiston Co., 17 Battery Place, New York, N. Y.

Feeders, Chlorine, Amonia and Chemical

387. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. % 96 Codding St., Providence, R. I.

Filter Bed Agitator

388. 60-page booklet, "The Mechanics of Filter Bed Agitation," containing engineering data, technical information concerning surface wash and opinions of users will be sent promptly by Activated Alum Corp., Curtis Bay, Baltimore, Md.

Filter Plant Controllers

389. "The Modern Filter Plant" and the uses of Simplex Controllers for operation are described in a handy, 16-page booklet. Charts, data, curves and tables. Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Fire Hydrants

390. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M. & H. Valve & Fittings Co., Anniston, Ala.

391. See listing No. 410.

Flow Meters

393. The primary devices for flow measurement—the orifice, the pilot tube, the venturi meter and others — and the application to them of the Simplex meter are described in a useful 24-page booklet (42A). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Gates, Valves, Hydrants

394. Gate, flap and check valves; floor stands and fittings. New catalog No. 34 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Anniston, Ala.

395. Complete booklet with much worthwhile water works data describes fully Ludlow hydrants and valves. Sent on request. Ludlow Valve Mfg. Co., Troy, N. Y.

396. See listing No. 410.

Gauges

398. The full line of Simplex gauges for filtration plants are illustrated and described in catalog issued by Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Hypochlorinators

400. New illustrated booklet W&T 357 describes this simple, inexpensive means of protecting small water supplies such as summer camps, hotels, swimming pools, dairies, etc., as well as for feeding chemical solutions in the water works plant. Contains typical installation sketches. Write "Wallace & Tiernan Co., Inc., Newark, N. J.

Manhole Covers and Inlets

402. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend, Ind.

Manhole Cover Silencers

403. New bulletin on Tapax for quickly ending noisy manhole covers and small sample free. Write Tapax Mfg. Co., 201 Hoyt Ave., Mamaroneck, N. Y.

Meters, Venturi

405. MS Meters for use with venturi tubes, flow nozzles, etc., in wall, panel, or floor mounting are covered in detail in catalog sent free by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia, Pa.

406. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corroson, clogged pipes, etc. Write Builders Iron Foundry, Codding St., Providence, R. I.

Meters, Water

407. Complimentary bulletin W529 tells all about Pittsburgh IMO water meters, "the meters that wear in where others wear out." Write Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

Pipe, Cast Iron

408. Handbook of Universal Cast Iron Pipe and Fittings, pocket size, 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York, N. Y.

409. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

410. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., 400 Chestnut St., Philadelphia, Pa.

Pipe Forms

411. Making concrete pipe on the job to give employment at home is the subject of a new booklet just issued by Quinn Wire and Iron Works, 1621 Twelfth St., Boone, Ia., manufacturers of "Heavy Duty" Pipe Forms. Sent promptly on request.

Pipe, Reinforced Concrete

412. Literature describing the manufacture and installaton of Lock Joint Reinforced Concrete Pressure Pipe for water supply lines and sewer force mains. Lock Joint Pipe Co., Ampere, N. J.

Pipe, Transite

413. Two new illustrated booklets, "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York, N. Y.

Pipe Joints, Sewer

415. How to make a perfect sewer pipe joint—tight, prevents roots entering sewer, keeps lengths perfectly aligned; can be laid with water in trench or pipe. General instructions issued by L. A. Weston, Adams, Mass.

Pipe, 2-inch Cast Iron

417. The new McWane 2" cast iron

pipe in 18-foot lengths has innumerable uses in water and sewage work. Send for the new McWane bulletin describing this pipe, the various joints used, and other details about it. McWane Cast Iron Pipe Co., Birmingham, Ala.

Pumps and Well Water Systems

420. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis, Tenn.

Meter Setting and Testing

430. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

Recarbonation

431. Bulletin describes stabilizing lime-softened water by recarbonation, discussing gas production, washing, compressing, drying, and applying the CO(2). International Filter Co., 325 West 25th Place, Chicago, Ill.

Sand Expansion Indicator

432. New bulletin gives full details of Simplex Sand Expansion Indicators for water plants. Write Simplex Valve & Meter Co., 6750 Upland St., Philadelphia, Pa.

434. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.

Steel Sheet Piling

435. Steel sheet piling to speed sewer jobs is covered in illustrated catalog containing complete production specifications. Write Dept. PW-2, The Union Metal Mfg. Co., Canton, Ohio.

436. "Metal Sheeting for Lower Average Job Costs" is a new bulletin about light weight sheeting you can use again and again. Issued by Armco Drainage Products Assn., Middletown, Ohio.

Sewers

437. "ARMCO Sewers" is the title of a 48-page booklet describing the structural and other advantages of ARMCO Ingot Iron. Paved Invert and Asbestos-Bonded pipe for storm and sanitary sewers. Design data and large charts will be found helpful by engineers engaged in the design or construction of sewers. Copies will be sent on request by the Armco Drainage Products Association, Middletown, Ohio, or its associated member companies.

Septic Tanks, Small

438. Septic Disposal Systems, Waterless Toilets, Multiple Toilets for Camps and Resorts, and other products for providing safer sewage disposal for unsewered areas are described and illustrated in data sheets issued by San-Equip Inc., 504 E. Glen St., Syracuse, N. Y.

Sludge Drying and Incineration

440. "Disposal of Municipal Refuse." Complete specifications and description including suggested form of proposal; form of guarantees; statements and approval sheet for comparing bids with diagramatic outline of various plant designs. 48 pages. Address: Morse Boulger Destructor Co., 216-P East 45th St., New York, N. Y.

441. Full information about Nichols modern, efficient gabage and refuse incinerators now available in the Basket Grate, Continuous Grate, Revolving Grate and Monohearth types will be sent promptly by Nichols Engineering and Research Corp., 60 Wall Tower, New York, N. Y.

442. Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

443. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes — a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Nichols Engineering and Research Corp., 60 Wall Tower, New York, N. Y.

Swimming Pools

446. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

447. 40-page Manual on swimming pools. Includes swimming and pool layouts, specifications, etc., and details concerning Permutit Swimming Pool Equipment. Write The Permutit Co., Dept. G-4, 330 West 42 St., New York, N. Y.

Taste and Odor Control

450. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

452. "Water and Sewage Chemistry" is the title of a valuable booklet for the operating man, reprinted from PUBLIC WORKS Magazine for December, 1940, by General Chemical Co., 40 Rector St., New York, N. Y.

Treatment

453. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

455. New booklet (No. 1642 on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Company, 2045 W. Hunting Park Ave., Philadelphia.

456. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewarage and water plants. Contains layout drawings, installation pictures, and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia, Pa.

457. New illustrated folder (1942) on Straightline apparatus for the removal and washing of grit and detritus from rectangular grit chambers. Address: Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

458. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York, N. Y.

459. A combination mechanical clarifier and mechanical digester, The Dorr Clarigester, is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York, N. Y.

460. This new 145 page illustrated chemical products book contains 55 pages of Tables, Factors and valuable Reference Data. Issued by General Chemical Co., 40 Rector St., New York, N. Y.

461. Preflocculation without chemicals with the Dorrco Clariflocculator in a single structure is the subject of a new booklet issued by The Dorr Company, 570 Lexington Ave., New York, N. Y.

462. Dorrco Monorake for existing rectangular sedimentation tanks, open or closed, is described and illustrated in a new catalog sent on request. The Dorr Co., 570 Lexington Ave., New York, N. Y.

Tunnel Liners

480. "Save Money with Armco *Light Duty* Tunnel Liner" is a bulletin you'll want if you are interested in economical, long lasting tunnels. Write Armco Drainage Products Assn., Middletown, Ohio.

Valves (See Gates, Air Release, etc.)

Water Works Operating Practices

490. "Important Factors in Coagulation" is an excellent review with bibliography and outlines of latest work done in the field. Written by Burton W. Graham and sent free on request to Activated Alum Corp., Curtis Bay, Baltimore, Md.

491. "Soft Water for Your Community" tells by means of many interesting pictures and text the advantages of soft water to any community. Ask for a copy from The Permutit Co., Dept. G4, 330 West 42nd St., New York, N. Y.

492. "Alkalies and Chlorine in the Treatment of Municipal and Industrial Water" is a new comprehensive survey filled with tables, charts, cost comparisons, etc., valuable to all who treat large volumes of water. Write Solvay Sales Corp., 40 Rector Street, New York City.

Water Service Devices

500. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati, Ohio.

For the Engineer's Library

Brief reviews of the latest books, booklets and catalogs for the public works engineer.

Valuable New Bulletin on Calcium Chloride

Calcium Chloride Association, Penobscot Bldg., Detroit, Mich.

It tells how dustless, firm military roads, airport runways and access roads can be speedily provided. Includes a chart of mechanized stabilization procedure; describes stabilized mixtures for military roads and airports, consolidated gravel surfaces using mixed-in-place methods, consolidated runways built for Selma airport and access roads at Kankakee Ordnance plant.

The association explains in this volume what calcium chloride is accomplishing in building and maintaining highways, access roads and airports and how to use it. Write for Bull. No. 26.

Water and Sewage Chemistry

General Chemical Co. 40 Rector St., New York

This reference book, *Water and Sewage Chemistry and Chemicals,* should find a place in the library of every plant manager, chemist and engineer interested in water or sewage treatment. It is a reprint of material which appeared recently in Public Works Magazine. General Chemical Company is pleased to make the booklet available now to those who may not have had the opportunity to read it.

Photographs, drawings, tables; and clear, concise writing make *Water and Sewage Chemistry and Chemicals* a valuable booklet for layman and technician alike!

To get your copy, simply write to General Chemical Company.

Asphalt Runway Surfacing for Bomber Flying Fields

The Asphalt Institute, 801 Second Ave., New York

An extremely timely publication, "Bomber Flying Fields," is a guide in the use of asphalt for heavy-duty paving in this important part of the vast new airport program. To obtain a copy without charge, write either to this magazine or direct to The Asphalt Institute.

Twinbatch 34E Paver

Koehring Company, Milwaukee, Wis.

In this well-illustrated catalog the manufacturer shows how seconds are saved with every batch. That is accomplished through the big, roomy flow-line skip, the natural flow self-cleaning water tank, extra long boom for long-reach concrete placing, extra large full batch size bucket with two doors and other practical features. A line to the manufacturer will bring your copy.

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